is included in the preamble for the proposed rule. EPA has conducted a preliminary analysis on exposure and risks to NTNCWSs and is asking for public comment on this preliminary analysis and on the proposed exclusion of NTNCWSs. An analysis of the potential benefits and costs of radon in drinking water for NTNCWSs is included in the docket for this proposed rulemaking. (USEPA 1999m)

## XIV. Administrative Requirements

### *A. Executive Order 12866: Regulatory Planning and Review*

Under Executive Order 12866, ''Regulatory Planning and Review'' (58 FR 51,735 (October 4, 1993)), the Agency must determine whether the regulatory action is ''significant'' and therefore subject to OMB review and the requirements of the Executive Order. The Order defines ''significant regulatory action'' as one that is likely to result in a rule that may:

(1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of E.O. 12866, it has been determined that this rule is a ''significant regulatory action''. As such, this action was submitted to OMB for review. Changes made in the proposal in response to OMB suggestions or recommendations will be documented in the public record.

### *B. Regulatory Flexibility Act (RFA)*

1. Today's Proposed Rule

Under the Regulatory Flexibility Act (RFA), 5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), EPA generally is required to conduct a regulatory flexibility analysis describing the impact of the regulatory action on small entities as part of rulemaking. Today's proposed rule may have significant economic impact on a substantial number of small entities and EPA has prepared an Initial Regulatory Flexibility Analysis (IRFA). In addition, when preparing an IRFA, EPA must convene a Small Business Advocacy Review (SBAR) Panel. A discussion of the Panel's recommendations and EPA's response to their recommendations is shown in Section 6.

2. Use of Alternative Small Entity Definition

The EPA is proposing that small CWS serving 10,000 people or less must comply with the AMCL, and implement a MMM program (if there is no state MMM program). This is the cut-off level specified by Congress in the 1996 amendments to the Safe Drinking Water Act for small system flexibility provisions. Because this definition does not correspond to the definitions of ''small'' for small businesses, governments, and non-profit organizations previously established under the RFA, EPA requested comment on an alternative definition of ''small entity'' in the Preamble to the proposed Consumer Confidence Report (CCR) regulation (63 FR 7620, February 13, 1998). Comments showed that stakeholders support the proposed alternative definition. EPA also consulted with the SBA Office of Advocacy on the definition as it relates to small business analysis. In the preamble to the final CCR regulation (63 FR 4511, August 19, 1998), EPA stated its intent to establish this alternative definition for regulatory flexibility assessments under the RFA for all drinking water regulations and has thus used it for this radon in drinking water rulemaking. Further information supporting this certification is available in the public docket for this rule.

*3. Background and Analysis*

The RFA requires EPA to address the following when completing an IRFA: (1) describe the reasons why action by the Agency is being considered; (2) state succinctly the objectives of, and legal basis for, the proposed rule; (3) describe, and where feasible, estimate the number of small entities to which the proposed rule will apply; (4) describe the projected reporting, record keeping, and other compliance requirements of the rule, including an estimate of the classes of small entities that will be subject to the requirements and the type of professional skills necessary for preparation of reports or records; (5) identify, to the extent practicable, all relevant Federal rules that may duplicate, overlap, or conflict with the proposed rule; and (6) describe any significant alternatives to the proposed rule that accomplish the stated objectives of applicable statutes while minimizing any significant economic impact of the proposed rule on small entities. EPA has considered and addressed all of the previously described requirements. The following is a summary of the IRFA.

The first and second requirements are discussed in Section II of this Preamble. The third, fourth, and sixth requirements are summarized as follows. The fifth requirement is discussed under Section VIII.A.2 of this Preamble in a subsection addressing potential interactions between the radon rule and upcoming and existing rules affecting ground water systems.

4. Number of Small Entities Affected

EPA estimates that 40,863 ground water systems are potentially affected by the proposed radon rule, with 96 percent of these systems serving less than 10,000 persons. Of the 39,420 small systems potentially affected, EPA estimates that 1,761 (4.4 percent) small systems will have to modify treatment (install treatment technology) to comply with the AMCL. The proposed rule recommends that small systems meet the 4,000 pCi/L AMCL and implement a multimedia mitigation (MMM) program if their State does not implement a MMM program. Small systems may also choose to comply with the MCL rather than implement an MMM program. As Table XIV.1 indicates, water mitigation administration costs for small systems remain the same under any State MMM program adoption scenario. However, small systems located in States that do not implement a MMM program must develop and implement their own MMM program for the population they serve (unless they choose to comply with the MCL), thus increasing their costs. Additional MMM implementation scenarios have been analyzed in the RIA (USEPA 1999f) which is included in the docket for this proposed rulemaking.

TABLE XIV.1.—ANNUAL WATER MITIGATION AND MMM PROGRAM COSTS TO SMALL SYSTEMS

[$Millions, 1997]

| Cost description | 100% of states adopt MMM | 50% of states adopt MMM |
|---|---|---|
| Water Mitigation Costs [1] | | |
| Total Capital Costs | 118.5 | 194.1 |
| Total Annual Costs [2] | 31.3 | 43.2 |
| Water Mitigation Administration Costs | 5.8 | 5.8 |
| Multimedia Mitigation Program Costs [3] | 0 | 43.3 |
| Total Small System Costs per Year | 37.1 | 92.4 |

**Notes**:
[1] Costs to small systems to mitigate water to the AMCL of 4,000 pCi/L.
[2] Includes annual capital costs, monitoring costs, and operation and maintenance costs.
[3] Does not include the costs of testing and mitigating homes.

5. Proposed Rule Reporting Requirements for Small Systems

The proposed radon rule requires small systems to maintain records and to report radon concentration levels at point-of-entry to the water system's distribution system. Small systems are also required to provide radon information in the Consumer Confidence Report, and if the system is implementing its own MMM program, reports on progress to the goals outlined in the system's MMM program plan. Radon monitoring and reporting for water mitigation will be required on a quarterly basis for at least one year, but thereafter the frequency may be reduced to annually or once every three years depending on the level of radon present (see Section VIII.E). Other existing information and reporting requirements, such as Consumer Confidence Reports and (proposed) public notification requirements, will be marginally expanded to encompass radon along with other contaminants (see Section X). As is the case for other contaminants, required information on system radon levels must be provided by affected systems and is not considered to be confidential. The professional skills necessary for preparing the reports are the same skill level required by small systems for current reporting and monitoring requirements.

The classes of small entities that are subject to the proposed radon rule include public groundwater systems serving less than 10,000 people. Small systems are further classified into very very small systems (serving 25–500 persons), very small systems (serving 501–3,300 persons, and small systems (serving 3,301–10,000 persons).

6. Significant Regulatory Alternatives and SBAR Panel Recommendations

In response to the SBAR Panel's recommendations and other small entity concerns, EPA has included several requirements to help reduce the impacts of the proposed radon rule on small entities. These requirements include: (1) Recommendation of small system compliance with the MMM/AMCL option; (2) less routine monitoring; (3) State granting of waivers to ground water systems to reduce monitoring frequency; and (4) encouraging and providing information about the use of low maintenance treatment technologies. A more complete discussion of the SBAR Panel recommendations and EPA's responses follow here. EPA also believes small systems can in some cases reduce their economic burden by a variety of means, including using the State revolving fund loans to offset compliance costs. In the development of this proposed rulemaking, EPA considered several regulatory alternatives to the proposed requirements for small systems. The proposal includes the regulatory expectation that they comply with the AMCL of 4,000 pCi/L and be associated with either a state or local MM program. EPA believes that this option will provide equivalent or greater health protection while reducing economic burdens to small systems. For a more detailed description of the alternatives considered in the development of the proposed rule see the RIA (USEPA 1999f) or the discussion of regulatory alternatives in Section XIV.C (Unfunded Mandates Reform Act).

In addition to being summarized here, the public docket for this proposed rulemaking includes the SBAR Panel's report on the proposed radon regulation, which outlines background information on the proposed radon rule and the types of small entities that may be subject to the proposed rule; a summary of EPA's outreach activities; and the comments and recommendations of the small entity representatives (SERs) and the Panel.

(a) *Consultations.* Consistent with the requirements of the RFA as amended by SBREFA, EPA has conducted outreach directly to representatives of small entities that may be affected by the proposed rule. Anticipating the need to convene a SBAR Panel under Section 609 of the RFA/SBREFA, in consultation with the Small Business Administration (SBA), EPA identified 23 representatives of small entities that were most likely to be subject to the proposal. In April, 1998, EPA prepared an outreach document on the radon rule titled ''Information for Small Entity Representatives Regarding the Radon in Drinking Water Rule'' (USEPA 1998b). EPA distributed this document to the small entity representatives (SERs), as well as stakeholder meeting discussion documents and the executive summary of the February 1994 document ''Report to the United States Congress on Radon in Drinking Water: Multimedia Risk and Cost Assessment of Radon'' (EPA 1994a).

On May 11, 1998, EPA held a small entity conference call from Washington DC to provide a forum for small entity input on key issues related to the planned proposal of the radon in drinking water rule. These issues included: (1) Issues related to the rule development, such as radon health risks, occurrence of radon in drinking water, treatment technologies, analytical methods, and monitoring; and (2) issues related to the development and implementation of the multimedia mitigation program guidelines. Thirty people participated in the conference call, including 13 SERs from small water systems from Arizona, California, Nebraska, New Hampshire, Utah, Washington, Alabama, Michigan, Wyoming, and New Jersey.

Efforts to identify and incorporate small entity concerns into this rulemaking culminated with the convening of a SBAR Panel on July 9, 1998, pursuant to Section 609 of RFA/SBREFA. The four person Panel was headed by EPA's Small Business Advocacy Chairperson and included the Director of the Standards and Risk Management Division within EPA's

Office of Ground Water and Drinking Water, the Administrator of the Office of Information and Regulatory Affairs with the Office of Management and Budget, and the Chief Counsel for Advocacy of the SBA. For a 60-day period starting on the convening date, the Panel reviewed technical background information related to this rulemaking, reviewed comments provided by the SERs, and met on several occasions. The Panel also conducted its own outreach to the SERs and held a conference call on August 10, 1998 with the SERs to identify issues and explore alternative approaches for accomplishing environmental protection goals while minimizing impacts to small entities. Details of the Panel process, along with summaries of the conference calls with the SERs and the Panel's findings and recommendations, are presented in the September 1998 document ''Final Report of the SBREFA Small Business Advocacy Review Panel on EPA's Planned Proposed Rule for National Primary Drinking Regulation: Radon'' (USEPA 1998c).

*(b) Recommendations and Actions.*—Today's notice incorporates all of the recommendations on which the Panel reached consensus. In particular, the Panel made a number of recommendations regarding the MMM program guidelines, including that the guidelines be user-friendly and flexible and provide a viable and realistic alternative to meeting the MCL, for both States and CWSs. The Panel also agreed that provision of information to the public and equity are important considerations in the design of an MMM program.

In response to the Panel's recommendations and concerns heard from other stakeholders, EPA has developed specific criteria that MMM programs must meet to be approved by EPA. EPA believes these criteria are simple and straightforward and provide the flexibility States and public water systems need to develop programs to meet their different needs and concerns. The criteria permit States, with public participation and input, to determine their own prospective indoor radon risk reduction goals and to design the program strategies they determine are needed to achieve these goals. The criteria build on the existing framework of State indoor radon programs that are already working to get indoor radon risk reduction. EPA also believes that equity issues can be most effectively discussed and resolved with the public's participation and involvement in development of goals and strategies for an MMM program. Providing customers of public water systems with information about the health risks of radon and on the AMCL and MMM program option will help to promote understanding of the significant public health risks from radon in indoor air and help the public to make informed choices. Section VI of this Preamble discusses the MMM program in greater detail.

Following is a summary of the other Panel recommendations and EPA's response to these recommendations, by subject area:

*Occurrence:* The Panel recommended that EPA continue to refine its estimates of the number of affected wells. The occurrence section of the preamble contains an expanded description in regard to how EPA refined the estimates of the number of affected water supply wells (See Section XI.C ''EPA's Most Recent Studies of Radon Levels in Ground Water'').

*Water Treatment:* The Panel recommended the following: provide clear guidance for when granular activated carbon (GAC) treatment may be appropriate as a central or point-of-entry unit treatment technology; consider and include in its regulatory cost estimates, to the extent possible, the complete burden and benefits; and carefully consider effects of radon-off-gassing from aeration towers and potential permitting requirements in developing regulations or guidance related to aeration.

In response to these recommendations, the treatment section of the preamble contains an expanded description regarding conditions under which granular activated carbon (GAC) treatment may be appropriate as a central or point-of-entry unit treatment technology (See Section VIII.A.3 ''Centralized GAC and Point-of-entry GAC''); the RIA and the treatment sections of the preamble describe the components which contribute to the regulatory economic analysis (See Section VIII.A.2 ''Treatment Costs: BAT, Small Systems Compliance Technologies, and Other Treatment''); high-end treatment cost estimates have been revised to include scenarios where air-permitting costs are much higher than typical cases (see Sections VIII.A.2 ''Treatment Cost Assumptions and Methodology'' and ''Comparison of Modeled Costs with Real Costs from Case Studies''); and information and rationale has been added to support EPA's belief that permitting requirements from off-gassing from aeration towers will not preclude installation of aeration treatment (see Section VIII.A.3 ''Evaluation of Radon Off-Gas Emissions Risks'').

In addition, the Panel recommended that EPA fully consider the relationship of the Radon in Drinking Water Rule with other rules affecting the same small entities. In response, the treatment section of the preamble, the Treatment and Cost Document, and the RIA have been expanded to discuss the relationship of treatment for radon with other drinking water rules including the Ground Water Rule, Lead and Copper Rule, and the Disinfection By-Products Rules (see Section VIII.A.2 ''Potential Interactions Between the Radon Rule and Upcoming and Existing Rules Affecting Ground Water Systems'').

*Analytical Methods and Monitoring:* The Panel recommended the following: fully consider the availability and capacity of certified laboratories for radon analysis and consider the costs of monitoring; consider applying the VOCs sampling method to radon to reduce the need for additional training; reduce the frequency of monitoring after initial determination of compliance and consider providing waivers from monitoring requirements when a system is not at risk of exceeding the MCL; and develop monitoring requirements that are simple and easy to interpret to facilitate compliance by small systems.

In response, the analytical methods section of the preamble includes discussion of the availability and capacity of certified laboratories for radon analysis (see Section VIII.C ''Laboratory Capacity—Practical Availability of the Methods''); and a clarification that the radon sampling method is the same as for the volatile organic carbons sampling method (see Section VIII.B.2 ''Sampling Collection, Handling and Preservation''). The RIA and the preamble include more detailed discussion of regulatory costs estimates including the monitoring costs estimated (see Section VIII.B.2 ''Cost of Performing Analysis''). The monitoring section proposed rule provides for a reduced monitoring frequency to once every three years if the average of four quarterly samples is less than 1/2 MCL/AMCL, provided that no sample exceeds the MCL/AMCL (see Section VIII.E.4 ''Increased/decreased monitoring requirements'' and Section 141.28(b) of the proposed rule). Section VIII.E.5 ''Grandfathering of Data'' and Section 141.28(b) of the proposed rule describes the allowance of grandfathered data, i.e., data collected after proposal of the rule, that meet specified requirements. Section VIII.E.4 ''Increased/decreased monitoring requirements'' of this Preamble discusses the allowance for States to grant waivers to ground water systems to reduce the frequency of monitoring, i.e., up to a 9 year

frequency. Section VIII.E, Table VIII.E.1 of this Preamble also describes monitoring requirements to facilitate interpretation of the requirements.

*General:* The Panel recommended that EPA explore options for providing technical assistance to small entities to clearly communicate the risks from radon in drinking water and indoor air, the rationale supporting the regulation, and actions consumers can take to reduce their risks. Therefore, this Preamble has been written to clarify to the public the risks from radon in drinking water and radon in indoor air, and the rationale supporting the proposed regulation (see Sections I through V of this Preamble).

*Areas in which Panel did not reach consensus:* There were also a number of issues discussed by the Panel on which consensus was not reached. These included the appropriateness of the Agency's affordability criteria for determining if affordable small system compliance technologies are available, the appropriate level at which to set the MCL, whether EPA should provide a ''model'' MMM program for use by small systems in states that do not adopt state-wide MMM programs, and whether information on the risks of radon and options for reducing it provides ''health risk reduction benefits'' (as referenced in the SDWA) independent of whether homes are actually mitigated or built radon resistant. A detailed discussion of these issues is included in the Panel report. EPA is requesting comment on some of these issues in other parts of the preamble. To read the full discussion of the issues on which EPA is requesting comment, see Sections VII.A ''Requirements for Small Systems Serving 10,000 People or Less'', VII.D ''Background on Selection of MCL and AMCL'', and VI.F ''Local CWS MMM Programs in Non-MMM States and State Role in Approval of CWS MMM Program Plans.''

### *C. Unfunded Mandates Reform Act (UMRA)*

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), P.L. 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under UMRA Section 202, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with ''Federal mandates'' that may result in expenditures to State, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule, for which a written statement is needed, Section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of Section 205 do not apply when they are inconsistent with applicable law. Moreover, Section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation on why that alternative was not adopted.

Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed, under Section 203 of the UMRA, a small government agency plan. The plan must provide for notification to potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates and informing, educating, and advising small governments on compliance with the regulatory requirements.

#### 1. Summary of UMRA Requirements

EPA has determined that this rule contains a Federal mandate that may result in expenditures of $100 million or more for State, local, and tribal governments, in the aggregate, or the private sector in any one year. Accordingly, EPA has prepared, under Section 202 of the UMRA, a written statement addressing the following areas: (1) Authorizing legislation; (2) cost-benefit analysis including an analysis of the extent to which the costs to State, local, and tribal governments will be paid for by the Federal government; (3) estimates of future compliance costs; (4) macro-economic effects; and (5) a summary of EPA's consultation with State, local, and tribal governments, a summary of their concerns, and a summary of EPA's evaluation of their concerns. A summary of this analysis follows and a more detailed description is presented in EPA's Regulatory Impact Analysis (RIA) of the Radon Rule (USEPA 1999f) which is included in the docket for this proposed rulemaking.

*(a) Authorizing legislation.* Today's proposed rule is proposed pursuant to Section 1412(b)(13) of the 1996 amendments to the SDWA which requires EPA to propose and promulgate a national primary drinking water regulation for radon, establishes a statutory deadline of August 1999 to propose this rule, and establishes a statutory deadline of August 2000 to promulgate this rule.

*(b) Cost-benefit analysis.* Section XIII.B of this preamble, describing the Regulatory Impact Analysis (RIA) and Revised Health Risk Reduction and Cost Analysis (HRRCA) for radon, contains a detailed cost-benefit analysis in support of the radon rule. Today's proposed rule is expected to have a total annualized cost of approximately $121 million with a range of potential impacts from $60.4 to $407.6 million, depending on how many States and local PWSs adopt MMM programs and comply with the AMCL. This total annualized cost consists of total annual impacts on State, local, and tribal governments, in aggregate, of approximately $53.5 million and total annual impacts on private entities of approximately $67.6 million (Note: these estimates are based on Scenario A which assumes 50 percent of States implement MMM programs with the remaining 50 percent of States implementing system-level MMM programs or complying with the MCL. Under Scenario E, total costs are approximately $60.4 million. Total national costs of full compliance with an MCL are approximately $407.6 million. Detailed descriptions of the national costs and MMM scenarios are shown in Section XIII of this preamble and Sections 9 and 10 of the RIA (USEPA 1999f).

The RIA includes both qualitative and monetized benefits for improvements in health and safety. EPA estimates the proposed radon rule will have annual monetized benefits of approximately $17.0 million if the MCL were to be set at 4,000 pCi/L and $362 million if set at 300 pCi/L. The monetized health benefits of reducing radon exposures in drinking water are attributable to the reduced incidence of fatal and non-fatal cancers, primarily of the lung and stomach. Under baseline assumptions (no control of radon exposure), 168 fatal cancers and 9.7 non-fatal cancers per year are associated with radon exposures through CWSs. At a radon level of 4,000 pCi/L, an estimated 2.9 fatal cancers and 0.2 non-fatal cancers per year are prevented. At a level 300 pCi/L, 62.0 fatal and 3.6 non-fatal cancers per year are prevented. The Agency believes that compliance with an AMCL of 4,000 pCi/L and implementation of a MMM program would result in health benefits equal to or greater than those achieved by complying with the proposed MCL (300 pCi/L).

In addition to quantifiable benefits, EPA has identified several potential non-quantifiable benefits associated with reducing radon exposures in drinking water. These potential benefits are difficult to quantify because of the uncertainty surrounding their estimation. Non-quantifiable benefits may include any peace-of-mind benefits specific to reduction of radon risks that may not be adequately captured in the Value of Statistical Life (VSL) estimate. In addition, if chlorination is added to the process of treating radon via aeration, arsenic pre-oxidization will be facilitated. Neither chlorination nor aeration will remove arsenic, but chlorination will facilitate conversion of Arsenic (III) to Arsenic (V). Arsenic (V) is a less soluble form that can be better removed by arsenic removal technologies. In terms of reducing radon exposures in indoor air, provision of information to households on the risks of radon in indoor air and the availability of options to reduce exposure may be a non-quantifiable benefit that can be attributed to some components of a MMM program. Providing such information might allow households to make more informed choices about the need for risk reduction given their specific circumstances and concerns than they would have in the absence of a MMM program.

*(i) State and Local Administrative Costs.* States will incur a range of administrative costs with the MCL and MMM/AMCL options in complying with the radon rule. Administrative costs associated with water mitigation can include costs associated with program management, inspections, and enforcement activities. EPA estimates the total annual costs of administrative activities for compliance with the MCL to be approximately $2.5 million.

Additional administrative costs will be incurred by those States who comply with the AMCL and develop an MMM program plan. In this case, States will need to satisfy the four criteria for an acceptable MMM program which include: (1) Involve the public in developing the MMM program plan; (2) set quantitative State-wide goals for reducing radon levels in indoor air; (3) submit and implement plans on existing and new homes; and (4) develop and implement plans for tracking and reporting results. The administrative costs will consist of the various activities necessary to satisfy these four criteria. Because EPA is unable to specify the number of States that will implement an MMM program, administrative costs were estimated under two assumptions: (1) 50 percent of States (all water systems in those States) implement an MMM program; and (2) 100 percent of States implement an MMM program, since we expect that most States will choose this option.

If a State does not develop an MMM program plan, any local water system may chose to meet the AMCL and prepare an MMM program plan for State approval. Administrative costs to the State would consist primarily of reviewing local program plans and overseeing compliance. However, local water systems would bear administrative costs that resemble the State costs to administer an MMM program. To estimate costs for local water systems in these States, EPA assumed that all local systems that exceeded 300 pCi/L but were less than 4,000 pCi/L would choose to administer an MMM program rather than achieve the 300 pCi/L level through water mitigation. It is assumed that, on average, water mitigation costs will exceed MMM program administrative costs for local water systems.

EPA estimates that total annual costs of approximately $13.2 million are expected if half the States elect to administer an MMM program and all local water systems in the remaining States undertake MMM programs. In this case, costs to 50 percent of the States to administer the MMM program ($2.9 million), and costs to 50 percent of the States to approve MMM programs developed by local water systems ($7.8 million) are added to water mitigation costs ($2.5 million). In this latter case there would also be costs to local water systems of $45 million to develop and implement local MMM programs. This is the total cost per year across all system sizes to develop and implement system-level MMM programs and assumes approximately 45 percent of CWSs will do a system-level MMM plan. The total costs across all system sizes under Scenario E for system-level MMM programs is approximately $5 million.

Various Federal financial assistance programs exist to help State, local, and tribal governments comply with this rule. To fund development and implementation of a MMM program, States have the option of using Public Water Systems Supervision (PWSS) Program Assistance Grant funds [SDWA Section 1443(a)(1)] and Program Management Set-Aside funds from the Drinking Water State Revolving Fund (DWSRF) program. Infrastructure funding to provide the equipment needed to ensure compliance is available from the DWSRF program and may be available from other Federal agencies, including the Housing and Urban Development's Community Development Block Grant Program or the Department of Agriculture's Rural Utilities Service.

EPA provides funding to States that have a primary enforcement responsibility for their drinking water programs through the PWSS grants program. States may use PWSS grant funds to establish and administer new requirements under their primacy programs, including MMM programs. PWSS grant funds may be used by a State to set-up and administer a State MMM program.

States may also ''contract'' to other State agencies to assist in the development or implementation of their primacy program, including an MMM program for radon. However, States may not use grant funds to contract to regulated entities (i.e., water systems) for MMM program implementation.

An additional source of EPA funding to develop and implement a MMM program is through the DWSRF program. The program awards capitalization grants to States, which in turn use funds to provide low cost loans and other types of assistance to eligible public water systems to assist in financing the costs of infrastructure needed to achieve or maintain compliance with SDWA requirements. The DWSRF program also allows a State to set aside a portion of its capitalization grant to support other activities that result in protection of public health and compliance with the SDWA. The State Program Management set-aside (SDWA Section 1452(g)(2)) allows a State to reserve up to ten percent of its DWSRF allotment to assist in implementation of the drinking water program. States must match expenditures under this set-aside dollar for dollar. DWSRF State Program Management set-aside funds can be used to fund activities to develop and run an MMM program, similar to those eligible for funding from PWSS grant funds.

States may also use State Indoor Radon Grant (SIRG) funds to assist States in funding their MMM programs. The Agency has determined that activities that implement MMM activities and that meet current SIRG eligibility requirements can be carried out with SIRG funds because the goals of the MMM program reinforce and enhance the goals, strategies, and priorities of the existing State indoor radon programs that rely on funding through the SIRG program. However, expenditure of SIRG will not be permitted to fund strictly water-related activities, such as testing or monitoring of water by CWSs.

*(c) Estimates of future compliance costs.* To meet the requirement in Section 202 of the UMRA, EPA analyzed future compliance costs and possible disproportionate budgetary effects of both the MCL and MMM/AMCL options. The Agency believes that the cost estimates, indicated previously and discussed in more detail in Section XIII.B of today's preamble accurately characterize future compliance costs of the proposed rule.

*(d) Macroeconomic effects.* As required under UMRA Section 202, EPA is required to estimate the potential macro-economic effects of the regulation. These types of effects include those on productivity, economic growth, full employment, creation of productive jobs, and international competitiveness. Macro-economic effects tend to be measurable in nationwide econometric models only if the economic impact of the regulation reaches 0.25 percent to 0.5 percent of Gross Domestic Product (GDP). In 1998, real GDP was $7,552 billion so a rule would have to cost at least $18 billion annually to have a measurable effect. A regulation with a smaller aggregate effect is unlikely to have any measurable impact unless it is highly focused on a particular geographic region or economic sector. The macro-economic effects on the national economy from the radon rule should be negligible based on the fact that, assuming full compliance with an MCL, the total annual costs are approximately $43.1 million at the 4,000 pCi/L level and about $407.6 million at the 300 pCi/L level (at a 7 percent discount rate) and the costs are not expected to be highly focused on a particular geographic region or industry sector.

*(e) Summary of EPA's consultation with State, local, and tribal governments and their concerns.* Consistent with the intergovernmental consultation provisions of section 204 of the UMRA and Executive Order 12875 ''Enhancing Intergovernmental Partnership,'' EPA has already initiated consultations with the governmental entities affected by this rule. EPA initiated consultations with governmental entities and the private sector affected by this rulemaking through various means. This included four stakeholder meetings, and presentations at meetings of the American Water Works Association, the Association of State Drinking Water Administrators, the Association of State and Territorial Health Officials, and the Conference of Radiation Control Program Directors. Participants in EPA's stakeholder meetings also included representatives from National Rural Water Association, National Association of Water Companies, Association of Metropolitan Water Agencies, State department of environmental protection representatives, State health department representatives, State water utility representatives, the Inter Tribal Council of Arizona, and representatives of other tribes. EPA also made presentations at tribal meetings in Nevada, Alaska, and California. To address the proposed rule's impact on small entities, the Agency convened a Small Business Advocacy Review Panel in accordance with the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA). EPA also held two series of three conference calls with representatives of State drinking water and State radon programs. In addition to these consultations, EPA made presentations on the proposed Radon Rule to the Association of California Water Agencies, the National Association of Towns and Townships, the National League of Cities, and the National Association of Counties. Several State drinking water representatives also participated in AWWA's Technical Workgroup for Radon.

The Agency also notified governmental entities and the private sector of opportunities to provide input on the Health Risk Reduction and Cost Analysis (HRRCA) for radon in drinking water in the **Federal Register** on February 26, 1999 (64 FR 9559). The HRRCA was published six months in advance of this proposal and illustrated preliminary cost and benefit estimates for various MCL options under consideration for the proposed rule. The comment period on the HRRCA ended on April 12, 1999, and EPA received approximately 26 written comments. Of the 26 comments received concerning the HRRCA, 42 percent were from States and 4 percent were from local governments.

The public docket for this proposed rulemaking contains meeting summaries for EPA's four stakeholder meetings on radon in drinking water, all comments received by the Agency, and provides details about the nature of State, local, and tribal governments' concerns. A summary of State, local, and tribal government concerns on this proposed rulemaking is provided in the following section.

In order to inform and involve tribal governments in the rulemaking process, EPA staff attended the 16th Annual Consumer Conference of the National Indian Health Board on October 6–8, 1998, in Anchorage, Alaska. Over nine hundred persons representing Tribes from across the country were in attendance. During the conference, EPA conducted two workshops for meeting participants. The objectives of the workshops were to present an overview of EPA's drinking water program, solicit comments on key issues of potential interest in upcoming drinking water regulations, and to solicit advice in identifying an effective consultative process with tribes for the future.

EPA, in conjunction with the Inter Tribal Council of Arizona (ITCA), also convened a tribal consultation meeting on February 24–25, 1999, in Las Vegas, Nevada to discuss ways to involve tribal representatives, both tribal council members and tribal water utility operators, in the stakeholder process. Approximately twenty-five representatives from a diverse group of tribes attended the two-day meeting. Meeting participants included representatives from the following tribes: Cherokee Nation, Nezperce Tribe, Jicarilla Apache Tribe, Blackfeet Tribe, Seminole Tribe of Florida, Hopi Tribe, Cheyenne River Sioux Tribe, Menominee Indian Tribe, Tulalip Tribes, Mississippi Band of Choctaw Indians, Narragansett Indian Tribe, and Yakama Nation.

The major meeting objectives were to: (1) Identify key issues of concern to tribal representatives; (2) solicit input on issues concerning current OGWDW regulatory efforts; (3) solicit input and information that should be included in support of future drinking water regulations; and (4) provide an effective format for tribal involvement in EPA's regulatory development process. EPA staff also provided a brief overview on the forthcoming radon rule at the meeting. The presentation included the health concerns associated with radon, EPA's current position on radon in drinking water, the distinction between an MCL and AMCL, the multimedia mitigation (MMM) program, and specific issues for tribes. The following questions were posed to the tribal representatives to begin discussion on radon in drinking water: (1) Will tribal governments be interested in substituting MMM for drinking water control; (2) what types of MMM could tribes reasonably implement; and (3) what resources are available to fund MMM? The summary for the February 24–25, 1999, meeting was sent to all 565 Federally recognized tribes in the United States.

EPA also conducted a series of workshops at the Annual Conference of the National Tribal Environmental Council which was held on May 18–20, 1999, in Eureka, California. Representatives from over 50 tribes attended all, or part, of these sessions.

The objectives of the workshops were to provide an overview of forthcoming EPA regulations affecting water systems; discuss changes to operator certification requirements; discuss funding for tribal water systems; and to discuss innovative approaches to regulatory cost reduction. Tribal representatives were generally supportive of regulations which would ensure a high level of water quality, but raised concerns over funding for regulations. With regard to the forthcoming proposed radon rule, many tribal representatives saw the multimedia mitigation option as highly desirable, but felt that this option may not be adapted unless funds were made available for home mitigation. Meeting summaries for EPA's tribal consultations are available in the public docket for this proposed rulemaking.

*(f) Nature of state, local, and tribal government concerns and how EPA addressed these concerns.* State and local governments raised several concerns, including the high costs of the rule to small systems; the high degree of uncertainty associated with the benefits; the high costs of including Non-Transient Non-Community Water Systems (NTNCWSs); and the inclusion of risks to both smokers and non-smokers in the proposed regulation. Tribal governments raised several concerns with the MMM program, including where the funding to mitigate homes would come from; the number of homes that would require testing; and the frequency of home testing.

EPA understands the State, local, and tribal government concerns with the issues described previously. The Agency believes that the options for small systems, proposed for public comment in this rulemaking, will address stakeholder concerns pertaining to small systems and will help to reduce the financial burden to these systems.

Non-Transient Non-Community Water Systems (NTNCWSs) are not subject to this proposed rulemaking. A detailed discussion of the exposure to radon in NTNCWSs is shown in Section XII.D of this preamble. EPA has conducted a preliminary analysis on exposure and risks to NTNCWSs and is soliciting public comment on this preliminary analysis. An analysis of the potential benefits and costs of radon in drinking water for NTNCWSs is included in the docket for this proposed rulemaking. (USEPA 1999m)

EPA has included the risks to both ever-smokers and never-smokers in this proposed rulemaking. The Agency is basing this regulation on the risks to the general population and is not excluding any particular segments of the population. For a more complete discussion on the risks of radon in drinking water and air, see Section XII of this preamble.

EPA understands tribal governments' concerns with funding for the MMM program. To assist State, local, and tribal governments with the implementation of an MMM program, EPA is making available Public Water Supply Supervision (PWSS) Program Assistance Grant Funds, Drinking Water State Revolving Fund (DWSRF) funds, and State Indoor Air Grant (SIRG) funds. A more complete discussion of the funding available to State, local, and tribal governments for MMM program implementation is shown in Section XIV.C.1(b) of this preamble.

*(g) Regulatory Alternatives Considered.* As required under Section 205 of the UMRA, EPA considered several regulatory alternatives in developing an MCL for radon in drinking water. In preparation for this consideration, the Regulatory Impact Analysis and Health Risk Reduction and Cost Analysis (HRRCA) for Radon evaluated radon levels of 100, 300, 500, 700, 1,000, 2,000, and 4,000 pCi/L.

The Regulatory Impact Analysis and HRRCA also evaluated national costs and benefits of MMM implementation, with States choosing to reduce radon exposure in drinking water through an Alternative Maximum Contaminant Level (AMCL) and radon risks in indoor air through MMM programs. Based on the National Academy of Sciences recommendations, the AMCL level that was evaluated is 4,000 pCi/L. For further discussion on the regulatory alternatives considered in this proposed rulemaking, see Section XIII.B of this preamble.

EPA believes that the regulatory approaches proposed in today's notice are the most cost-effective options for radon that achieve the objectives of the rule, including strong public health protection. For a complete discussion of this issue, see EPA's Regulatory Impact Analysis and Revised HRRCA for Radon (USEPA 1999f).

2. Impacts on Small Governments

In preparation for the proposed radon rule, EPA conducted analysis on small government impacts. This rule may significantly impact small governments. EPA included small government officials or their designated representatives in the rule making process. EPA conducted four stakeholder meetings on the development of the radon rule which gave a variety of stakeholders, including small governments, the opportunity for timely and meaningful participation in the regulatory development process. Groups such as the National Association of Towns and Townships, the National League of Cities, and the National Association of Counties participated in the proposed rulemaking process. Through such participation and exchange, EPA notified potentially affected small governments of requirements under consideration and provided officials of affected small governments with an opportunity to have meaningful and timely input into the development of the regulatory proposal.

EPA also held a conference call on May 11, 1998, to consult directly with representatives of small entities that may be affected by the proposed rule. This conference call provided a forum for Small Entity Representative (SER) input on key issues related to the proposed radon rule. These issues included: (1) Issues related to the rule development, such as radon health risks, occurrence of radon in drinking water, treatment technologies, analytical methods, and monitoring; and (2) issues related to the development and implementation of the MMM program guidelines.

As required by SBREFA, EPA also convened a Small Business Advocacy Review (SBAR) Panel to help further identify and incorporate small entity concerns into this proposed rulemaking. For a sixty-day period starting in July 1998, the Panel reviewed technical background information related to this rulemaking, reviewed comments provided by the SERs, and met on several occasions with EPA and on one occasion with the SERs to identify issues and explore alternative approaches for accomplishing environmental goals while minimizing impacts to small entities. The SBAR final report on the proposed radon rule, which includes a description of the SBAR Panel process and the Panel's findings and recommendations, is available in the public docket for this proposed rulemaking. For a more detailed discussion of the Panel report, see Section XIV.B of this preamble.

In addition, EPA will educate, inform, and advise small systems, including those run by small governments, about the radon rule requirements. One of the most important components of this process is the Small Entity Compliance Guide, required by the Small Business Regulatory Enforcement Fairness Act of 1996 after the rule is promulgated. This plain-English guide will explain what actions a small entity must take to comply with the rule. Also, the Agency is developing fact sheets that concisely describe various aspects and requirements of the radon rule.

*D. Paperwork Reduction Act (PRA)*

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* An Information Collection Request (ICR) document has been prepared by EPA (ICR, No. 1923.01) and a copy may be obtained from Sandy Farmer by mail at OP Regulatory Information Division, U.S. Environmental Protection Agency (2137), 401 M St., SW, Washington, DC 20460; by email at farmer.sandy@epa.gov; or by calling (202) 260–2740. A copy may also be downloaded off the Internet at http://www.epa.gov/icr.

Two types of information will be collected under the proposed radon rule. First, information on individual water systems and their radon levels will enable the States and EPA to evaluate compliance with the applicable MCL or AMCL. This information, most of which consists of monitoring results, corresponds to information routinely collected from water systems for other types of drinking water contaminants. Radon monitoring and reporting will initially be required on a quarterly basis for at least one year, but thereafter the frequency may be reduced to annually or once every three years depending on the level of radon present (see Section VIII.E). Other existing information and reporting requirements, such as Consumer Confidence Reports and (proposed) public notification requirements, will be marginally expanded to encompass radon along with other contaminants. As is the case for other contaminants, required information on system radon levels must be provided by affected systems and is not considered to be confidential.

The second type of information relates to the MMM program, which is EPA's recommended approach for small systems under the proposed radon rule. Information of this type includes MMM plans prepared by States as well as MMM plans prepared by community ground water systems in States that do not develop a MMM plan. The proposed rule allows States to prepare MMM plans regardless of whether they are primacy States with respect to drinking water programs. EPA will review the MMM plans developed by States, and States will review system-level MMM plans. These reviews will help ensure that MMM programs are likely to achieve meaningful reductions in human health risks from radon exposure. Acceptable MMM plans will include a plan for the collection of data to track the progress of the MMM program relative to goals established in the plans (*e.g.*, data on the number or rate of mitigated homes and the number or rate of new homes built radon resistant). EPA will review State-level MMM programs at least every five years, and States will review system-level programs at least every five years. Information related to MMM programs (i.e., the MMM plans and tracking data) is mandatory for States that choose to implement an EPA-approved MMM program and enforce the AMCL for radon rather than the MCL. Similarly, information related to system-level MMM programs is required only from systems that comply with the AMCL rather than the MCL and are in States that do not have a MMM program in place.

EPA believes the information discussed previously, on compliance with the MCL or AMCL and on MMM programs, is essential to achieving the radon-related health risk reductions anticipated by EPA under the proposed rule.

EPA has estimated the burden associated with the specific record keeping and reporting requirements of the proposed rule in an accompanying Information Collection Request (ICR), which is available in the public docket for this proposed rulemaking. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

EPA has estimated a range of administrative costs for the proposed rule. These costs do not include testing and mitigating water or testing and mitigating households in the MMM program. The PRA requires that average annual cost and labor for administrative costs be calculated over a three-year period. These costs are presented next. However, because the full implementation of the proposed rule does not occur until later years, average annual cost and labor for a 20-year period are also presented. These 20-year average annual costs are presented by scenarios defined by the proportions of systems that elect to develop system-level MMM programs and the proportions of states that elect to implement state-wide MMM programs. These scenarios are described in detail in Section XIII.G and Section 9 of the RIA (USEPA 1999f). Based on these analyses, EPA's burden estimates for the proposed rule, in both costs and hours, are as follows:

- Administrative costs to community groundwater systems for mitigation-related activities are estimated to be $14.6 million per year ($357 per system) or 267,625 hours, distributed by system size as shown in Table XIV.2. All 40,863 community groundwater systems will bear these costs under all scenarios evaluated.
- In the first three years of the rule, there are no administrative costs to community groundwater systems for MMM program activities.

TABLE XIV.2.—ADMINISTRATIVE COSTS TO COMMUNITY WATER SYSTEMS ASSOCIATED WITH WATER MITIGATION AND SYSTEM-LEVEL MMM PROGRAMS (EXCLUDING MMM TESTING AND MITIGATION)

| System size (customers served) | Administrative costs of water mitigation ($ per year) | Administrative costs of system-level MMM programs ($ per year) |
|---|---|---|
| VVS (25–100) | 4,485,485 | 0 |
| VVS (101–500) | 4,958,735 | 0 |
| VS (501–3,300) | 3,430,387 | 0 |
| S (3,301–10,000) | 848,487 | 0 |
| M (10,001–100K) | 491,944 | 0 |

TABLE XIV.2.—ADMINISTRATIVE COSTS TO COMMUNITY WATER SYSTEMS ASSOCIATED WITH WATER MITIGATION AND SYSTEM-LEVEL MMM PROGRAMS (EXCLUDING MMM TESTING AND MITIGATION)—Continued

| System size (customers served) | Administrative costs of water mitigation ($ per year) | Administrative costs of system-level MMM programs ($ per year) |
|---|---|---|
| L (>100K) | 23,579 | 0 |
| Total For All Systems | 14,598,617 | 0 |

• Administrative costs to States for water mitigation-related activities are to be approximately $3 million per year (Table XIV.3) and 119,625 hours, or approximately $65,400 per year per state and 2,600 hours per year per state. Forty-six states bear these costs under all scenarios.

Table XIV.3 presents the costs if 100 percent of all states were to incur the specific administrative costs listed. However, no state will bear 100 percent of state-wide MMM program costs and 100 percent of system-level MMM program costs. These costs will be borne in an inverse relationship; e.g., 95 percent of the states will bear administrative costs associated with state-wide MMM programs and 5 percent of states will bear administrative costs associated with system-level MMM programs.

TABLE XIV.3.—STATE ADMINISTRATIVE COSTS FOR WATER MITIGATION AND MMM PROGRAMS

| | ($ per year) |
|---|---|
| Water Mitigation | 3,009,713 |
| State-Wide MMM Programs | 6,346 |
| System-Level MMM Programs | 5,909 |
| Total State Administrative Costs | 3,021,968 |

• State administrative costs associated with state-wide MMM programs are estimated up to $6,300 per year and up to 140 hours per year for the first three years of the rule.

• State administrative costs to review system-level MMM programs and related activities are estimated up to $5,900 per year and up to 123 hours per year for the first three years of the rule.

• The total State administrative costs (water mitigation, state-wide, and system-level MMM programs) are estimated up to approximately $3 million per year and 119,887 hours per year.

Because much of the activity required under the proposed rule occurs in later years, this analysis presents average administrative costs borne by systems and states over a 20 year period. Again, these costs do not include water testing and mitigation or testing and mitigating households in MMM programs. In addition, these costs are presented by scenarios that are defined by the proportions of systems that elect to develop system-level MMM programs and the proportions of states that elect to implement state-wide MMM programs.

• Administrative costs to community groundwater systems for mitigation-related activities are estimated to be $8.6 million per year ($211 per system) or 145,547 hours per year, distributed by system size as shown in Table XIV.4. All 40,863 community groundwater systems will bear these costs under all scenarios evaluated.

• Under Scenario A, administrative costs to community groundwater systems for MMM program activities are approximately $45.1 million per year ($2,452 per system) or 174,000 hours per year for the 18,388 systems (45 percent of all community groundwater systems) that develop and file an MMM plan. The costs are distributed across the system size categories as shown in Table XIV.4. Under Scenario E, administrative costs to systems are $5.0 million per year or 19,333 hours per year. The per-system cost is the same as Scenario A, but only five percent of systems (2,042) bear these costs.

TABLE XIV.4.—ADMINISTRATIVE COSTS TO COMMUNITY WATER SYSTEMS ASSOCIATED WITH WATER MITIGATION AND SYSTEM-LEVEL MMM PROGRAMS

[Excluding MMM Testing and Mitigation]

| System size (customers served) | Administrative costs of water mitigation ($ per year) | Administrative costs of system-level MMM programs under scenario A ($ per year | Administrative costs of system-level MMM programs under scenario E ($ per year |
|---|---|---|---|
| VVS (25–100) | 2,857,190 | 14,978,142 | 1,664,238 |
| VVS (101–500) | 2,923,970 | 15,328,217 | 1,703,135 |
| VS (501–3,300) | 2,022,764 | 10,603,857 | 1,178,206 |
| S (3,301–10,000) | 500,319 | 2,622,804 | 291,423 |
| M (10,001–100K) | 290,080 | 1,520,674 | 168,964 |
| L (>100K) | 13,904 | 72,886 | 8,097 |
| Total for All Systems | 8,608,226 | 45,126,581 | 5,014,065 |

• Total administrative costs to community water systems (water mitigation plus MMM programs) range from $11 million per year under Scenario E to $51.2 million under Scenario A or 165,000 hours under Scenario E to 320,000 hours under Scenario A. The costs are distributed across the various system sizes as shown in Table XIV.5.

TABLE XIV.5.—TOTAL ADMINISTRATIVE COSTS WATER MITIGATION AND MMM PROGRAMS TO COMMUNITY GROUNDWATER SYSTEMS

| System size (customers served) | Total administrative costs under scenario A ($ per year) | Total administrative costs under scenario E ($ per year) |
|---|---|---|
| VVS (25–100) | 16,990,791 | 3,676,887 |
| VVS (101–500) | 17,387,906 | 3,762,824 |
| VS (501–3,300) | 11,238,829 | 1,813,178 |
| S (3,001–10,000) | 3,412,697 | 1,081,316 |
| M (10,001–100,000) | 1,873,106 | 521,396 |
| L (100,000) | 256,893 | 192,105 |
| Total for All Systems | 51,160,223 | 11,047,707 |

• Administrative costs to States for water mitigation-related activities are estimated to be approximately $2.5 million per year (Table XIV.6) or approximately $53,900 per year per state. Total state burden is approximately 100,000 hours per year. Forty-six states bear these costs under all scenarios.

TABLE XIV.6.—STATE ADMINISTRATIVE COSTS FOR WATER MITIGATION AND MMM PROGRAMS

[$ per year]

| | Scenario A | Scenario E |
|---|---|---|
| Water Mitigation | 2,477,299 | 2,477,299 |
| State-Wide MMM Programs | 2,926,691 | 5,560,713 |
| System-Level MMM Programs | 7,830,995 | 870,111 |
| Total State Administrative Costs | 13,234,985 | 8,908,123 |

• State administrative costs associated with state-wide MMM programs are estimated to be $2.9 million dollars ($127,200 per state across 23 states) or 123,000 hours per year under Scenario A. Under Scenario E, estimated state administrative costs of state-level MMM programs are estimated to be $5.6 million (again $126,400 per state, but under this scenario, 44 states bear the costs) or 233,000 hours per year for all 44 states.

• State administrative costs to review system-level MMM programs and related activities are estimated to be $7.8 million per year or 316,410 hours per year under Scenario A and approximately $870,000 per year or 35,157 hours per year under Scenario E. In both cases the cost per state is approximately $371,000 per year, with 21 states affected under Scenario A and two states affected under Scenario E.

• The total State administrative costs (water mitigation, state-wide, and system-level MMM programs) are estimated to be $13.2 million per year or 538,845 hours per year under Scenario A and $8.9 million per year or 367,878 hours per year under Scenario E.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

Comments are requested on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, OP Regulatory Information Division, U.S. Environmental Protection Agency (2137), 401 M St., SW., Washington, DC 20460 and to the Office of Management and Budget, 725 17th St., NW., Washington, DC 20503, marked ''Attention: Desk Officer for EPA''. Include the ICR number (1923.01) in any correspondence. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after November 2, 1999, a comment to OMB is best assured of having its full effect if OMB receives it by December 2, 1999. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

*E. National Technology Transfer and Advancement Act (NTTAA)*

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, § 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standard bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

EPA's process for selecting the analytical test methods is consistent with Section 12(d) of the NTTAA. EPA performed literature searches to identify analytical methods from industry, academia, voluntary consensus standard bodies, and other parties that could be

used to measure radon in drinking water.

This proposed rulemaking involves technical standards. EPA proposes to use Standard Method 7500–Rn, which is specific for radon 222 (radon) in drinking water, for both the MCL and AMCL for radon in drinking water. This method meets the objectives of the rule because it accurately and reliably detects radon in drinking water below 100 pCi/L. Standard Method 7500–Rn was approved by the Standard Methods Committee in 1996 and is described in the ''Standard Methods for the Examination of Water and Wastewater (19th Edition Supplement)'' which was prepared and published jointly by the American Public Health Association, American Water Works Association, and Water Environment Federation. Additional information on this method is shown in Section VIII.B.2 of today's preamble.

EPA is also proposing the use of the American Society for Testing and Materials (ASTM) Standard Test Method for Radon in Drinking Water (designation: D5072–92) for the AMCL for radon in drinking water. This method is specific for radon in drinking water, but has been shown to accurately and reliably detect radon only at concentrations above 1,500 pCi/L and thus is only useful for the AMCL. ASTM's Standard Test Method for Radon in Drinking Water was adopted by ASTM in 1992 and is described in the Annual Book of ASTM Standards. Additional information on this method is shown in Section VIII.B.2 of this preamble.

As discussed in Section VIII.B (Analytical Methods) of this preamble, EPA is in the process of adopting the Performance-Based Measurement System (PBMS) to allow greater flexibility in compliance monitoring for this proposed rule and for future rules. For further information on PBMS, see Section VIII.D.

EPA welcomes comments on this aspect of the proposed rulemaking and, specifically, invites the public to identify potentially-applicable voluntary consensus standards and to explain why such standards should be used in this regulation.

### *F. Executive Order 12898: Environmental Justice*

Executive Order 12898 ''Federal Actions To Address EnviroPopulations and Low-Income Populations,'' 59 FR 7629 (February 16, 1994) establishes a Federal policy for incorporating environmental justice into Federal agency missions by directing agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The Agency has considered environmental justice related issues concerning the potential impacts of this action and has consulted with minority and low-income stakeholders by convening a stakeholder meeting via video conference specifically to address environmental justice issues.

As part of EPA's responsibilities to comply with E.O. 12898, the Agency held a stakeholder meeting via video conference on March 12, 1998, to address various components of pending drinking water regulations; and how they may impact sensitive sub-populations, minority populations, and low-income populations. Topics discussed included treatment techniques, costs and benefits, data quality, health effects, and the regulatory process. Participants included national, State, tribal, municipal, and individual stakeholders. EPA conducted the meeting by video conference call between eleven cities. This meeting was a continuation of stakeholder meetings that started in 1995 to obtain input on the Agency's Drinking Water programs. The major objectives for the March 12, 1998, meeting were: (1) Solicit ideas from Environmental Justice (EJ) stakeholders on known issues concerning current drinking water regulatory efforts; (2) identify key issues of concern to EJ stakeholders; and (3) receive suggestions from EJ stakeholders concerning ways to increase representation of EJ communities in OGWDW regulatory efforts. In addition, EPA developed a plain-English guide specifically for this meeting to assist stakeholders in understanding the multiple and sometimes complex issues surrounding drinking water regulation. A meeting summary for the March 12, 1998, stakeholder meeting is available in the public docket for this proposed rulemaking.

Stakeholders have raised concerns that this action may have a disproportionate impact on low-income and minority populations. The rule framework and in particular, the MMM program coupled with a 4,000 pCi/L AMCL, were discussed with EJ stakeholders at the March 12, 1998, meeting. Key issues of concern with the MMM/AMCL approach included: (1) The potential for an uneven distribution of benefits across water systems and society; (2) the cost of air remediation to apartment dwellers; and (3) the concern that the approach could provide water systems and State governments a ''loophole'' through which they could escape the responsibility of providing appropriate protection from radon exposures.

The Agency considered equity-related issues concerning the potential impacts of MMM program implementation. There is no factual basis to indicate that minority and low income or other communities are more or less exposed to radon in drinking water than the general public. However, some stakeholders expressed more general concerns about equity in radon risk reduction that could arise from the MMM/AMCL framework outlined in SDWA. One concern is the potential for an uneven distribution of risk reduction benefits across water systems and society. Under the proposed framework for the rule, customers of CWSs complying with the AMCL could be exposed to a higher level of radon in drinking water than if the MCL were implemented, though this level would not be higher than the background concentration of radon in ambient air. However, these CWS customers could also save the cost, through lower water rates, of installing treatment technology to comply with the MCL. Under the proposed regulation, CWSs and their customers have the option of complying with either the AMCL (associated with a State or local MMM program) or the MCL.

EPA believes it is important that these issues and choices be considered in an open public process as part of the development of MMM program plans. Therefore, EPA has incorporated requirements into the proposed rule that provide a framework for consideration of equity concerns with the MMM/AMCL. The proposed rule includes requirements for public participation in the development of MMM program plans, as well as for notice and opportunity for public comment. EPA believes that the requirement for public participation will result in State and CWS program plans that reflect and meet their different constituents needs and concerns and that equity issues can be most effectively dealt with at the State and local levels with the participation of the public. In developing their MMM program plans, States and CWSs are required to document and consider all significant issues and concerns raised by the public. EPA expects and strongly recommends that States and CWSs pay particular attention to addressing any equity concerns that may be raised during the public participation process. In addition, EPA believes that providing CWS customers with information about the health risks of radon and on the

AMCL and MMM program option will help to promote understanding of the health risks of radon in indoor air, as well as in drinking water, and help the public to make informed choices. To this end, EPA is requiring CWSs to alert consumers to the MMM approach in their State in consumer confidence reports issued between publication of the final radon rule and the compliance dates for implementation of MMM programs. This will include information about radon in indoor air and drinking water and where consumers can get additional information.

The proposed requirements include the following: (1) A description of processes the State used to provide for public participation in the development of its MMM program plan; (2) a description of the nature and extent of public participation that occurred, including a list of groups and organizations that participated; (3) a summary describing the recommendations, issues, and concerns arising from the public participation process and how these were considered in developing the State's MMM program plan; (4) a description of how the State made information available to the public to support informed public participation, including information on the State's existing indoor radon program activities and radon risk reductions achieved, and on options considered for the MMM program plan along with any analyses supporting the development of such options; and (5) the State must provide notice and opportunity for public comment on the plan prior to submitting it to EPA.

The public is invited to comment on this aspect of the proposed rulemaking and, specifically, to recommend additional methods to address EJ concerns with the MMM/AMCL approach for treating radon in drinking water.

*G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks*

Executive Order 13045, ''Protection of Children from Environmental Health Risks and Safety Risks,'' 62 FR 19885 (April 23, 1997) applies to any rule that: (1) Is determined to be ''economically significant'' as defined under E.O. 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

This proposed rule is not subject to the Executive Order because the Agency does not have reason to believe the environmental health risks or safety risks addressed by this action present a disproportionate risk to children. Based on the risk assessment for radon in drinking water developed by the NAS, children were not identified as being disproportionately impacted by radon. The Committee on Risk Assessment of Exposure to Radon in Drinking Water that conducted the National Research Council Risk Assessment of Radon in Drinking Water Study (NAS 1999b) concluded, except for the lung cancer risk to smokers, there is insufficient scientific information to permit quantitative evaluation of radon risks to susceptible subpopulations such as infants, children, pregnant women, elderly, and seriously ill persons.

The National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation (BEIR VI) (NAS 1999a) noted that there is only one study (tin miners in China) that provides data on whether risks from radon progeny are different for children, adolescents, and adults. Based on this study, the committee concluded that there was no clear indication of an effect of age at exposure, and the committee made no adjustments in the model for exposures received at early ages (NAS 1999a). Nonetheless, we evaluated the environmental health or safety effects of radon in drinking water on children. The results of this evaluation are contained in Section XII of this preamble. Copies of the documents used to evaluate the environmental health or safety effects of radon in drinking water on children, including the NAS Reports, have been placed in the public docket for this proposed rulemaking.

The public is invited to submit or identify peer-reviewed studies and data, of which EPA may not be aware, that assessed results of early life exposure to radon in drinking water.

*H. Executive Orders on Federalism*

Under Executive Order 12875, ''Enhancing the Intergovernmental Partnership,'' 58 FR 58093 (October 28, 1993) EPA may not issue a regulation that is not required by statute and that creates a mandate upon State, local, or tribal government, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by those governments, or EPA consults with those governments. If EPA complies by consulting, E.O. 12875 requires EPA to provide to the Office of Management and Budget a description of the extent of EPA's prior consultation with representatives of affected State, local, and tribal governments, the nature of their concerns, any written communications from the governments, and a statement supporting the need to issue the regulation. In addition, E.O. 12875 requires EPA to develop an effective process permitting elected officials and other representatives of State, local, and tribal governments ''to provide meaningful and timely input in the development of regulatory proposals containing significant unfunded mandates.''

EPA has concluded that this rule will create a mandate on State, local, and tribal governments and the Federal government will not provide the funds necessary to pay the direct costs incurred by State, local, and tribal governments in complying with the mandate. In developing this rule, EPA consulted with State, local, and tribal governments to enable them to provide meaningful and timely input in the development of this rule.

As described in Section XIV.C.1.e, EPA held extensive meetings with a variety of State and local representatives, who provided meaningful and timely input in the development of the proposed rule. Summaries of the meetings have been included in the public docket for this proposed rulemaking. See Sections XIV.C.1.e and XIV.C.1.f for summaries of the extent of EPA's consultation with State, local, and tribal governments; the nature of the governments' concerns; and EPA's position supporting the need to issue this rule.

On August 4, 1999, President Clinton issued a new executive order on federalism, Executive Order 13132 [64 FR 43255 (August 10, 1999)], which will take effect on November 2, 1999. In the interim, the current Executive Order 12612 [52 FR 41685 (October 30, 1987)], on federalism still applies. This rule will not have a substantial direct effect on States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among various levels of government, as specified in Executive Order 12612. ''This proposed rule establishes a National Primary Drinking Water Regulation (NPDWR) for the control of radon. This regulation is required by section 1412(b)(13) of the Safe Drinking Water Act, as amended. EPA conducted extensive discussions with States and local governments in developing this proposal, and significant flexibility is provided in implementing these regulations.''

*I. Executive Order 13084: Consultation and Coordination With Indian Tribal Governments*

Under Executive Order 13084, ''Consultation and Coordination with Indian Tribal Governments,'' 63 FR 27655 (May 19, 1998) EPA may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian tribal governments, and that imposes substantial direct compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or EPA consults with those governments. If EPA complies by consulting, E.O. 13084 requires EPA to provide the Office of Management and Budget, in a separately identified section of the preamble to the rule, a description of the extent of EPA's prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, E.O. 13084 requires EPA to develop an effective process permitting elected officials and other representatives of Indian tribal governments ''to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.''

EPA has concluded that this rule will significantly or uniquely affect communities of Indian tribal governments. It will impose substantial direct compliance costs on such communities, and the Federal government will not provide the funds necessary to pay the direct costs incurred by the tribal governments in complying with the rule. In developing this rule, EPA consulted with representatives of tribal governments pursuant to both E.O. 12875 and E.O. 13084. Summaries of the meetings have been included in the public docket for this proposed rulemaking. EPA's consultation, the nature of the governments' concerns, and EPA's position supporting the need for this rule are discussed in Section XIV.C.2 of this preamble.

*J. Request for Comments on Use of Plain Language*

Executive Order 12866 and the President's memorandum of June 1, 1998, require each agency to write all rules in plain language. We invite your comments on how to make this proposed rule easier to understand. For example:

- Have we organized the material to suit your needs?
- Are the requirements in the rule clearly stated?
- Does the rule contain technical language or jargon that isn't clear?
- Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand?
- Would more (but shorter) sections be better?
- Could we improve clarity by adding tables, lists, or diagrams?
- What else could we do to make the rule easier to understand?

**Stakeholder Involvement**

## XV. How Has the EPA Provided Information to Stakeholders in Development of This NPRM?

*A. Office of Ground Water and Drinking Water Website*

EPA's Office of Ground Water and Drinking Water maintains a website on radon at the following address: *http://www.epa.gov/safewater/radon.html.* Documents are placed on the website for public access.

*B. Public Meetings*

EPA has consulted with a broad range of stakeholders and technical experts. Participants in a series of stakeholder meetings held in 1997 and 1998 included representatives of public water systems, State drinking water and indoor air programs, tribal water utilities and governments, environmental and public health groups, and other Federal agencies. EPA convened an expert panel in Denver in November, 1997, to review treatment technology costing approaches. The panel made a number of recommendations for modification to EPA cost estimating protocols that have been incorporated into the radon cost estimates. EPA also consulted with a subgroup of the National Drinking Water Advisory Council (NDWAC) on evaluating the benefits of drinking water regulations. The NDWAC was formed in accordance with the Federal Advisory Committee Act (FACA) to assist and advise EPA. A variety of stakeholders participated in the NDWAC benefits working group, including utility company staff, environmentalists, health professionals, State water program staff, a local elected official, economists, and members of the general public.

EPA conducted one-day public meetings in Washington, D.C. on June 26, 1997; in San Francisco, California on September 2, 1997; and in Boston, Massachusetts on October 30, 1997, to discuss its plans for developing a proposed NPDWR for radon–222. EPA presented information on issues related to developing the proposed NPDWR and solicited stakeholder comments at each meeting. EPA also held a series of conference calls in 1998 and 1999 with State drinking water and indoor air programs, to discuss issues related to developing guidelines for multiedia mitigation programs. EPA also held a public meeting in Washington, DC. on March 16, 1999, to discuss the HRRCA published on February 26, 1999, and the multimedia mitigation framework.

*C. Small Entity Outreach*

EPA has conducted outreach directly to representatives of small entities that may be affected by the proposed rule, as part of SBREFA. A full discussion of the small entity outreach is in Section XIV.B.6 ''Significant Regulatory Alternatives and SBAR Panel Recommendations.''

*D. Environmental Justice Initiatives*

In order to uphold Executive Order 12898, ''Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,'' EPA's Office of Ground Water and Drinking Water convened a public meeting in Washington, DC in March 1998 to discuss ways to involve minority, low-income, and other sensitive subgroups in the stakeholder process and to obtain input on the proposed radon rule. The meeting was held in a video-conference format linking EPA Regions I through IX to involve as many stakeholders as possible. EPA has taken the concerns and issues raised by the environmental justice community into account while setting the MCL, MCLG, and AMCL for radon. For more information on the March 1998 environmental justice meeting, and on EPA proposals to address concerns of stakeholders, see Section XIV.F of this Preamble.

*E. AWWA Radon Technical Work Group*

The American Water Works Association (AWWA) convened a ''Radon Technical Work Group,'' in 1998 that provided technical input on EPA's update of technical analyses (occurrence, analytical methods, and treatment technology), and discussed conceptual issues related to developing guidelines for multimedia mitigation programs. Members of the Radon Technical Work Group included representatives from State drinking water and indoor air programs, public water systems, drinking water testing laboratories, environmental groups and the U.S. Geological Survey.

**Background**

## XVI. How Does EPA Develop Regulations to Protect Drinking Water?

### *A. Setting Maximum Contaminant Level Goal and Maximum Contaminant Level*

EPA sets an MCLG and MCL or treatment technology for each regulated contaminant. The MCLG is based on analysis of health effects of the contaminant. Based on the carcinogenicity of ionizing radiation, and the NAS' current recommendation for a linear, non-threshold relationship between exposure to radon and cancer in humans (NAS 1999a), the Agency is proposing an MCLG of zero for radon in drinking water.

A drinking water MCL applies to finished (treated) drinking water as supplied to customers. The SDWA generally requires that EPA set the MCL for each contaminant as close as feasible to the corresponding MCLG, based on available technology and taking costs into account. For example, if the analytical methods will only allow a relatively confident measure of a contaminant at a certain level, then the MCL cannot practically be set below that level. In addition, the cost of water treatment technologies is considered. If treatment capabilities are limited then the MCL must be set at a level that is found to be feasible. The MCL set by EPA must be protective of public health.

The 1996 amendments to SDWA require the Administrator to do a cost-benefit analysis of the MCLs under consideration and to make a determination as to whether the benefits of an MCL under consideration justify the costs (1412(b)(3)(C)). The Administrator may set an MCL at a level less stringent than the feasible level if he/she finds that the benefits of the feasible MCL do not justify the costs (1412(b)(6)(A)). There are certain exceptions to the use of this authority (1412(b)(6)(B) and (C)).

### *B. Identifying Best Available Treatment Technology*

As discussed also in Section VIII of this preamble, EPA identifies one or more water treatment technologies (i.e., best available treatment (BAT)) found to be effective in removing the contaminant from drinking water and capable of meeting the MCL. There are a number of physical, chemical, and other means used by such treatment technologies for removing the contaminant, or in some cases destroying the contaminant or otherwise changing the contaminant's composition. In assessing potential BATs, EPA examines removal efficiency, cost to purchase and maintain, compatibility with other processes, and other factors. Most of the information cited by EPA in this context is gleaned from technical literature, including research studies covering pilot or full scale treatments. If some of the treatments identified are found to be most efficient, practical and economical, EPA places these on the BAT list and on occasion may provide guidance on other treatments that may have certain limitations.

### *C. Identifying Affordable Treatment Technologies for Small Systems*

The 1996 Amendments to the SDWA directed EPA to identify treatment technologies that are affordable for small water systems. EPA is charged with identifying affordable treatments for three small system population categories: systems serving from 25 to 500, 501 to 3,300, and 3,301 to 10,000 persons. A designated ''compliance technology'' for these small systems may be a technology that is affordable and that achieves compliance with the MCL or a treatment technique requirement. Possible compliance technologies may include packaged or modular systems, and point-of-entry (POE) or point-of-use (POU) type treatment units. As with BAT designations, the compliance technology(ies) selected by EPA must be based upon available information from technical journals and/or qualified research studies.

EPA must also identify affordable ''variance technologies'' which are to be installed by a public water system after the system has applied to the responsible primacy agency for a variance, i.e., a ''small system variance.'' This variance applies only to systems serving fewer than 10,000 people. It also applies only in cases where an affordable technology is not available to achieve compliance with an MCL (or treatment technique requirement) yet still will be protective of public health. One of the requirements for systems that have obtained a variance is to install and maintain the variance technology in accordance with the listing by EPA, which may be specific to system size and/or dependent upon source water quality. A small system variance may only be obtained if compliance with the MCL through alternate source, treatment, or restructuring options are deemed not to be affordable for that system.

Small system variances are not available to meet MCL or treatment technique requirements promulgated prior to 1986, nor for regulations addressing microbiological contamination of water.

### *D. Requirements for Monitoring, Quality Control, and Record Keeping*

Water systems are responsible for conducting monitoring of drinking water to ensure that it meets all drinking water standards. To do this, water systems and States use analytical methods set out in EPA regulations.

EPA is responsible for evaluating analytical methods developed for drinking water and approves those methods that it determines meet Agency requirements. Laboratories analyzing drinking water compliance samples must be certified by the EPA or the State.

Whether addressing regulated or unregulated contaminants, EPA establishes requirements as to how often water systems must monitor for the presence of the subject contaminant. Water systems serving larger populations generally must conduct more monitoring (temporally and spatially) because there is a greater potential human health impact of any violation, and because of the physical extent of larger water systems (e.g., miles of pipeline carrying water). Small water systems can receive variances or exemptions from monitoring in limited circumstances. In addition, under certain conditions, a State may have the option to modify monitoring requirements on an interim or a permanent basis for regulated contaminants, with a few exceptions. States may use this flexibility to reduce monitoring requirements for systems with low risk of incurring a violation.

### *E. Requirements for Water Systems to Notify Customers of Test Results if Not in Compliance*

Each owner or operator of a public water system must notify customers if the system has failed to comply with an MCL or treatment technique requirement, or a testing procedure required by EPA regulation. A system must notify its customers if the system is subject to a variance (due to an inability to comply with an MCL).

The form of this notification must be readily understood and delivered via mail or direct delivery, through an annual report, or in the first water billing cycle following such a drinking water violation. The notification must also contain important information about the contaminant so that consumers will be aware of any particular hazards involved; the notification may indicate whether water can/cannot be consumed or used for bathing, whether boiling drinking water

will make it safe; or whether storing water before use may be advisable.

*F. Approval of State Drinking Water Programs to Enforce Federal Regulations*

Section 1413 of the SDWA sets requirements that a State or eligible Indian tribe must meet in order to maintain primary enforcement responsibility (primacy) for its public water systems. These include (1) adopting drinking water regulations that are no less stringent than Federal NPDWRs; (2) adopting and implementing adequate procedures for enforcement; (3) keeping records and making reports available on activities that EPA requires by regulation; (4) issuing variances and exemptions (if allowed by the State) under conditions no less stringent than allowed by Sections 1415 and 1416; (5) adopting and being capable of implementing an adequate plan for the provision of safe drinking water under emergency situations, and (6) adopting authority for administrative penalties.

In addition to adopting the basic primacy requirements, States may be required to adopt special primacy provisions pertaining to a specific regulation. These regulation-specific provisions may be necessary where implementation of the NPDWR involves activities beyond those in the generic rule. States are required by 40 CFR 142.12 to include these regulation-specific provisions in an application for approval of their program revisions.

## XVII. Important Technical Terms

*Adsorption:* In the case of the water/solid interface, the accumulation of a dissolved chemical species at the interface between a solid material (e.g., granular activated carbon) and water.

*Alpha particle:* A radioactivity decay product consisting of the charged helium-4 nucleus (two protons and two neutrons with a positive ionic charge of two, +2). Alpha particles are relatively heavy (8000 times as heavy as the beta particle) and are quickly absorbed by surrounding matter. The properties of alpha particles are such that they are only a health hazard if the emitter is in contact with living tissue. When outside the body, they do not penetrate the skin and are stopped by a few centimeters of air. However, when inside the body (breathed in or ingested), the alpha particle may ionize molecules within cells or may form ''free radicals'' (an atom or chemical group that contains an unpaired electron and which is very chemically reactive), either of which may result in the disruption of normal cellular metabolism and produce changes that affect cell replication which may induce cancerous cellular growth.

*Bq (becquerel):* An alternative unit of radioactivity is the Bq, which is equal to 1 disintegration per second. One pCi is equal to 0.037 Bq, and one Bq is equal to 27 pCi.

*cpm/dpm:* Counts per minute divided by radioactive disintegrations per minute; counting efficiency as determined by the counts per minute detected relative to the predicted disintegrations per minute in a well-characterized standard.

*Half-life:* The time required for one-half of a population of radioactive isotopes to decay; in the case of radioactive contaminants dissolved in water, it is the time for the concentration of the radioactive contaminant to decrease by a factor of two due to radioactive decay.

*Heterotrophic Plate Count:* A laboratory procedure for estimating the total bacterial count in a water sample (or ''bacterial density'').

*Individual Risk:* The risk to a person from exposure to radon in water is calculated by multiplying the concentration of radon in the water (pCi/L) by the unit risk factor (risk per pCi/L) for the exposure pathway of concern (ingestion, inhalation).

*Isotopes:* Two or more forms of an atomic element having the same number of protons, but differing in the number of neutrons. Some isotopes are stable (not radioactive) and some are radioactive, depending upon the ratio of neutrons and protons.

*Monte Carlo Analysis*:: Method of approximating a distribution of model solutions by sampling from simulated ''random picks'' from distributions of model input values.

*pCi (picocurie)*:: a unit of radioactivity equal to 0.037 radioactive disintegrations per second.

*Percentile:* For any set of observations, the ''pth percentile value'' is the value such that p% of the observations fall below the pth percentile value and (100-p)% fall above it.

*pH:* Numerical scale for measuring the relative acidity or basicity of an aqueous solution; values less than 7 are acidic (becoming increasingly so as they decrease) and above 7 are basic (becoming increasing so as they increase).

*Radioactivity:* The spontaneous disintegration of unstable atomic nuclei (central core of an atom), resulting in the formation of new atomic elements (daughter products), which may or may not themselves be radioactive, and the discharge of alpha particles, beta particles, or photons (other decay particles are known, but their parent isotopes do not occur in drinking water).

*Removal efficiency*: A measure of the ability of a particular water treatment process to remove a contaminant of interest; defined as the concentration of the contaminant in the treated water (effluent) divided by the concentration of the contaminant in the source water (influent).

*WL (working level)*: Any combination of radioactive chemicals that result in an emission of $1.3 \times 10^5$ MeV of alpha particle energy. One WL is approximately the total amount of energy released by the short-lived progeny in equilibrium with 100 pCi of radon.

*Working Level Month (WLM)*: 170 hours of exposure to one Working Level (WL) of radon progeny.

*Unit Risk*: The risk from lifetime exposure, via the inhalation and ingestion exposure routes, to water containing an unit concentration (1 pCi/L) of radon.

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## Appendix 1 to the Preamble: What Were the Major Public Comments on the 1991 NPRM and How Has EPA Addressed Them in This Proposal?

EPA received more than 600 comments on the Notice of Proposed Rulemaking (NPRM) of July 18, 1991 (56 FR 33050). Of the comments received, 289 were from public water suppliers, 89 were from individuals, 76 were from local governments, 52 were from States, 48 were from companies, 43 were from trade/professional organizations, 12 were from Federal agencies, 10 were from health/environmental organizations, 3 were from Members of Congress, and 2 were from universities. EPA received additional comments at public hearings on September 6, 1991, in Washington, DC and on September 12, 1991, in Chicago, Illinois.

Those commenting raised several concerns, including cost of rule implementation, especially for small public water systems, and the larger risk to public health from radon in indoor air from soil under buildings. The next sections summarize major public comments on the 1991 NPRM and provide brief responses in the following areas of most concern: (1) General issues; (2) statutory authority and requirements; (3) radon occurrence; (4) radon exposure and health effects; (5) maximum contaminant level; (6) analytical methods; (7) treatment technologies and costs; and (8) compliance monitoring. In many instances the following sections refer the reader to applicable sections in today's preamble where many of the issues have been fully discussed.

### A. General Issues

*Additional regulation:* Some public comments opposed additional regulation in general, and additional drinking water regulation in particular. Some comments also suggested EPA proceed with a more integrated approach to environmental regulation, i.e., that mitigation programs be designed to provide control over major exposure routes, which in the case of radon must take the soil gas source into account.

*EPA Response:* At the time of the 1991 proposal, EPA did not have authority under SDWA for a broader radon rule. However, the SDWA as amended in 1996 provides such authority. In addition to requiring EPA to promulgate a regulation for radon in drinking water, the SDWA radon provision also includes a less stringent alternative maximum contaminant level (AMCL) and a multimedia approach to address radon in indoor air. Much of the health threat is associated with radon emanating from soil gas into indoor air. Risk from drinking water particularly through the inhalation pathway is also a significant and preventable risk. Today's proposal addresses all major routes of exposure and is intended to promote multimedia mitigation (MMM) programs and implementation of the AMCL. Thus, the Agency expects to provide more cost-effective reductions in the health risks associated with radon.

*Federal funding for compliance and phased implementation:* Commenters asked the Agency for increased flexibility in complying with the proposed regulation through phased compliance; cheaper removal technologies; and/or additional Federal funding. Industry and other groups also recommended a phased implementation of radon removal, focusing first on priority water sources with the highest radon levels.

*EPA Response:* Today's proposal provides different compliance dates for compliance with the MCL and with the AMCL/MMM program, such that there will be sufficient time to implement the MMM program.

The Agency recognizes that the SDWA regulations will continue to place a significant burden on some small communities with limited tax bases and resources with which to attain compliance. The EPA drinking water State Revolving Fund provides support to the States and public and private water suppliers, in particular to small public water suppliers. This fund offers capitalization grants to the States for low-interest loans to help water systems comply with the SDWA (For more information refer to Section XIV.C.1 of today's preamble.)

In addition, EPA surveys of public and private water suppliers have been initiated to understand more clearly their needs in particular in terms of funding to support capital improvements in the context of implementing SDWA-related plans.

### B. Statutory Authority and Requirements

*Applicability to non-transient, non-community (NTNC) systems:* Ten commenters stated that EPA must provide better justification for regulating non-transient, non-community water systems along with community water systems. The indoor occupancy factors and exposure rates are different for persons in the workplace (i.e., school and hospital) than in the home. EPA should state clearly how the final rule will apply to this group.

*EPA Response:* About one-third of the systems estimated in 1991 as being affected by the final regulation were NTNC water systems. The Agency requested data in 1991 on NTNC system exposure patterns but received none; subsequently, the Agency conducted analysis on limited data on NTNC occurrence and exposure patterns and found the attendant exposures and risks to be relatively small in comparison to those estimated for community water supplies. (For more information refer to Section XI.D of today's preamble.)

In keeping with the flexibility accorded the Agency by SDWA to focus on areas of cognizable public health risk, EPA proposes that NTNC water systems not be required to comply with the proposed radon regulation. At the same time, EPA is soliciting comment and data related to this issue and has left open its options in terms of the final radon regulation.

*State authority:* Commenters felt that the Federal drinking water regulations should

not be uniform across the nation's drinking water supply. Many drinking water issues, including those which involve unique circumstances in the State and the necessary resources to implement programs, remain unresolved and perhaps are not resolvable by the Federal government. As a result, States will need to carry more of the responsibility in regulating drinking water given their familiarity with local circumstances.

*EPA Response:* The Agency acknowledges the unique circumstances faced by State primacy programs and public water systems. According to the framework set forth in the SDWA Amendments, States will have the option of adopting the MCL or the higher AMCL and the MMM program to address radon in indoor air. State programs in this area are expected to vary, in part due to radon occurrence patterns locally and in part due to State resources as they apply to monitoring public water systems; also States will have flexibility in MMM program implementation, and through consideration of variances and exemptions as allowed under SWDA.

**C. Radon Occurrence**

*Radon in PWS (Nationwide):* The American Water Works Association (AWWA) suggested that EPA's 1991 national occurrence estimates for radon were low compared to actual levels, i.e., greater than 20 percent low, resulting in an inaccurate EPA cost impact estimate. The Association suggested EPA consider the following changes to the radon occurrence analysis:

- Disaggregation of the National Inorganics and Radionuclides Survey (NIRS) occurrence data for the smallest public systems, i.e., those serving fewer than 500 persons, into two subsets of systems;
- An accounting in the radon occurrence analysis for geologic conditions in various regions by applying NIRS data in an area-specific manner;
- Updating and increasing the inventory (including NTNCs) based upon FRDS data;
- Inclusion of State radon data in the national occurrence analysis;
- EPA analyses may have underestimated radon in water levels because the location of sampling in NIRS was in the distribution systems (where natural decay of radon-222 may have been significant, thereby lowering occurrence estimates).

*EPA Response:* EPA analyses of these issues addressed the concerns described previously to the extent feasible (USEPA 1999c). The EPA analyses have incorporated the referenced issues as data allowed; the analyses also addressed newer data collected and/or submitted to EPA.

The Agency used State radon in drinking water data to refine the previous analysis that were based solely on the NIRS data. The Agency identified and obtained data from a number of States that supplement the geographic coverage, representativeness, and utility of the NIRS data in predicting the occurrence of radon in drinking water in the U.S. Additional data sets were obtained that, while not addressing radon distributions in States or regions, provided significant data related to the sampling, analytical, temporal and intra-system variability of radon measurements. The data from the NIRS and from the supplementary data sources were subjected to extensive statistical analysis to characterize their distribution and compare data sets.

These analyses are discussed and referenced in today's preamble Section XI.C. The results indicate that: radon levels seen in the NIRS data sets were generally slightly lower than those seen in the wellhead and point-of-entry data provided by the same States (with radon levels being more comparable in the very small systems due to short residence times); previous results were verified that radon levels in the U.S. are the highest in New England, the Appalachian uplands and other Western and Midwest regions; the levels of radon seen in the supplemental State data sets were similar to those seen in the NIRS data for the same regions; and, due to procedures used to adjust the NIRS data, the proportions of systems exceeding the various levels in the current study are greater than those seen in previous analyses.

However, best estimates of the numbers of systems exceeding regulatory levels in EPA's 1993 estimate for the 1994 EPA Report to Congress (USEPA 1994) and the central tendency estimates in the current analysis are quite similar. This is because the total estimated number of community and non-community non-transient systems that are believed to be active in the U.S. has decreased approximately 17 percent between 1993 and the Agency's current estimates. Part of this difference is due to system consolidation, and part may be due to improved methods for differentiating active from inactive systems, although the relative importance of these two factors is not known.

*Occurrence of radon in California:* A California drinking water industry association provided a number of resources including the following: a survey of its member agencies; a California Department of Health Services (DHS) Groundwater Study; and the Metropolitan Water District's (MWD) Southern California Radon Survey. The commenter produced estimated radon occurrence figures which far exceeded EPA's California and national occurrence profiles. The commenter's estimate predicted 75 percent to 97 percent of California public water systems out of compliance with a radon standard of 300 pCi/L. The commenter submitted to EPA additional methods and source data necessary for a complete EPA evaluation of this comment.

*EPA Response:* EPA studied the commenter's methodology for determining radon occurrence in California, proposed water system categorization scheme, and the sources of radon data (surveys mentioned previously), and has concluded the following:

- That sampling in the California surveys biased the results towards higher radon levels since data were apparently collected at the wellhead;
- The methods used in combining data sources (and in substitutions within data sets) resulted in substantial overestimation of radon occurrence in California ground water supplies.
- The commenter assumed 23 percent more public water supplies in California than indicated in then-current EPA FRDS records;
- The use of commenter's GIS-predicted radon levels for California systems was also problematic (USEPA 1999c).

EPA believes that EPA NIRS survey did not under represent the levels of radon in California. A comparison by EPA of the NIRS-California data and other California data reveals a similarity in results. Furthermore, EPA results are more in accord with California State predictions submitted to EPA during the same comment period.

*Variability of radon levels in water:* The American Water Works Service Company (AWWSC) provided technical information on the issue of radon variability in well water. AWWSC said that the variability of radon levels in well water is a phenomenon that could affect the compliance status of systems. AWWA and the Association of California Water Agencies also echoed concerns about the seasonal and diurnal variability in groundwater.

*EPA Response:* EPA analyzed this issue to determine if radon variability may or may not have any influence on national occurrence profiles. EPA reviewed the two available sources of information on radon variability (Kinner et al. 1990), and data supplied by the American Water Works Service Co. (AWWSC). The Kinner report was limited to four sites in New Hampshire that exhibited short-term and long-term variability of radon. The AWWSC data were drawn from 400 wells, nationwide, in 1986 and 1987. Kinner's data appear to indicate a radon fluctuation of 20 to 50 percent in well water over long-term intervals, weekly or biweekly. The short-term variability (15 to 180 minute intervals during a three month test at one site) showed a fluctuation of 50 percent as observed in the long-term test. These studies did not try to correlate any of the variability observed with well yield and water table level to account for the inconsistent patterns. The data provided were too limited to independently analyze factors that may have influenced radon level fluctuations. However, EPA notes that the short-term and long-term variabilities of radon observed at a single site were similar. This suggests that the long-term variability may be a reflection of random sampling where short-term influences are influencing radon levels.

The AWWSC analysis of radon in well water included sampling in the fall of 1986 and January 1987. A decrease of 29 percent on average was found over the two-month period. A change in analytical procedure accounted for about 10 percent of that difference. The remaining 19 percent difference was not explained. AWWSC also conducted a test of the effect of pumping time on radon levels over a short period (five days then two days), beginning with an idle period. AWWSC inferred that an observed initial increase in radon level (about 25 percent) was due to radon decay in water that had been sitting near the well casing. According to AWWSC, a subsequent decrease (much smaller) over two days was due to the drawing of less enriched water from beyond a potential geologic radon source yet within the cone of depression.

EPA believes that local geologic and operating conditions may produce temporal variations in radon levels in ground water sources. However, data are too limited to permit drawing of any conclusions. Also, since the Kinner and AWWSC reports cited water that generally contained radon in the high levels, 2,500 to 200,000 pCi/L, and 1,200 to 1,700 pCi/L, respectively, EPA cannot draw any conclusions on the effect(s) of short or long-term variability on radon in water at 300 pCi/L. Because EPA NIRS data represents single, one-time values for systems sampled, it produces no basis for a bias conclusion (*i.e.*, over- or under-estimates). On the contrary, the random nature of the NIRS survey would cancel any differences between the NIRS level and the ''true average'' radon level in public supplies.

*Radon Emanation from Pipe Scale Deposits:* Data received after the comment period, and subsequently reviewed by EPA, suggested that due to an existing radon source (radium-226) in some systems, levels of radon-222 may in some instances increase as water passes through water distribution systems.

*EPA Response:* A paper by Valentine et al. (Valentine 1992) contained data on the phenomenon of radon levels increasing in water distribution pipelines. In three of five distribution systems studied in Iowa, the paper's authors found what they refer to as radon ''hot spots.'' These systems have more radon in delivered water than at the entry to distribution. However, more geographically diverse data generally show that natural radon decay is a more influential factor as water is distributed. In other words, without nationally-relevant data to the contrary, it would be expected that within-distribution system radon decay supercedes radon production, except in very specific circumstances.

A more recent article by Field et al. (1995) reported that a case study of an Iowa water system with an average of 2.2 mg/L dissolved iron and 2.5 pCi/L of radium-226. The finished water entering the distribution system had a mean radon level of 432 ± 54 pCi/L (one standard deviation). Field et al. measured radon levels at the taps of 25 homes and measured radon levels ranging from 81 pCi/L to 2,675 pCi/L, with a mean of 1,108 ± 648 pCi/L. The authors concluded that iron scale deposits were sorbing radium-226, the parent of radon-222. In the case study reported, greater than 80% of the surface pipe-scale was comprised by iron oxides, with traces of scales containing calcium and silicon. Since iron oxides have been shown to selectively scavenge radium, it is plausible that a co-occurrence of high iron and radium levels may result in the production of significant levels of radon within the distribution system. Other factors that would determine the level of radon produced include concentration of radium-226 sorbed to the pipe scale, the quantity, distribution, and surface area of the scale, the composition of the scale, all of which are determined by the average finished water quality, and the length of time the water is in contact with the scale. All case studies were confined to the state of Iowa.

It remains to be shown that the confluence of conditions that result in significant radon production within distribution systems exists commonly at the national level or is confined to specific locales (e.g., areas with high average levels of iron, radium-226, and other site-specific factors).

Regarding this issue, information available at the present time does not support a determination as to the extent to which this phenomenon may occur in the U.S. The Agency is, however, soliciting comments in today's proposal on the advisability of requiring additional monitoring for radon as a source of consumer exposure from the distribution system, and on other radon occurrence issues.

**D. Radon Exposure and Health Effects**

Approximately 400 public comments were submitted on the assessments of exposure to and health effects of radon in the 1991 NPRM. The major issues raised in these comments, including comments regarding the proposed MCLG, are addressed next.

*Linear no-threshold dose response model:* Many commenters were concerned that EPA only used a linear no-threshold dose-response model in projecting cancer risk associated with low level exposure to radon in the domestic environment.

*EPA Response:* The shape of the dose-response curve for radon has been evaluated in detail by the NAS (1999a, 1999b), who concluded that essentially all available data are consistent with a linear non-threshold mechanism. This includes data on the effects of a wide range of ionizing radiation, as well as direct dose-response relationships observed for radon in animals studies and in studies of cohorts of underground miners. The EPA concurs with the NAS evaluation and conclusion.

*Age dependence on risk from radon exposure:* A few commenters stated that EPA should consider the effect of exposure at young ages. According to these commenters, the additional risks in children were not well addressed.

*EPA Response:* Data on the relative sensitivity of children to radon are sparse. In general, the NAS Radon in Drinking Water Committee concluded that there is insufficient scientific information to permit quantitative evaluation of the risks of lung cancer death from inhalation exposure to radon progeny in susceptible sub-populations such as infants, children, pregnant women, and elderly and seriously ill persons. However, the BEIR VI committee (NAS 1999a) noted that there is one study (tin miners in China) that provides data on whether risks from radon progeny are different for children, adolescents, and adults. Based on this study, the committee concluded that there was no clear indication of an effect of age at exposure, and the committee made no adjustments in the model for exposures received at early ages. This indicates that children are not an especially susceptible sub-group. With respect to cancer risk from ingestion of radon, NAS (1999b) performed an analysis to investigate the relative contribution of radon ingestion as a child to the total risk. This analysis considered the age dependence of water consumption, of the behavior of radon and its decay products in the body, of organ size, and of risk. The results indicated that dose coefficients are somewhat higher in younger people than adults. NAS (1999b) estimated that about 30 percent of a lifetime risk was due to exposures occurring during the first 10 years of life.

*Uncertainty of radon risk estimates:* Several commenters said EPA needs to provide a more in-depth discussion of the uncertainty associated with the risk estimates for radon.

*EPA Response:* EPA has performed a very detailed two-dimensional Monte Carlo evaluation of variability and uncertainty in exposure and risk from water-borne radon (USEPA 1993, 1995). The methods and inputs used by EPA were reviewed by the SAB and by NAS, and the results were judged to be appropriate and sound, subject to some refinements in the uncertainty bounds on some of the inputs. Based on the most recent recommendations from the NAS regarding the uncertainty in the risk coefficient for ingestion and inhalation exposure, EPA (1999d) has recalculated the uncertainty bounds around each risk estimate. In brief, the credible interval around the best estimate of individual and population risks from inhalation and ingestion exposure pathways are about four-fold and fourteen-fold, respectively.

*Extrapolation of high dose in mines to lower dose in homes:* Many commenters stated that the differences in dose between the mines and homes in the 1991 NAS report *Comparative Dosimetry of Radon in Mines and Homes* needs to be incorporated into the Agency's radon progeny inhalation risk calculation.

*EPA Response:* EPA and NAS both recognize the importance of potential differences between dose and risk per unit exposure in mines and in homes. The ratio of the dose to lung cells per WLM in the home compared to that in a mine is described by the K factor. Based on the best data available at the time, NAS (1991) had previously concluded that the dose to target cells in the lung was typically about 30 percent lower for a residential exposure compared to an equal WLM exposure in mines (i.e., K=0.7). The BEIR VI committee re-examined the issue of the relative dosimetry in homes and mines. In light of new information regarding exposure conditions in home and mine environments, the committee concluded that, when all factors are taken into account, the dose per WLM is nearly the same in the two environments (i.e., a best estimate for the K-factor is about 1) (NAS 1999a). The major factor contributing to the change was a downward revision in breathing rates for miners. Thus, NAS has concluded that the risk coefficient based on miners is appropriate for use in residences without adjustment.

*Possible confounding factors in mine studies:* Some commenters raised questions about the possible confounding factors in the miner epidemiological studies EPA used to project lung cancer risks. Commenters stated that, besides radon, exposure to other contaminants not found at home can produce synergistic effects. Such other contaminants could include diesel fumes, excessive dust

(which may be a problem in poorly constructed mines without adequate ventilation), and other radionuclides like uranium in the mine air.

*EPA Response:* The effects on radon risk estimates from potentially toxic exposures to substances such as silica, uranium dust, blasting fumes, and engine exhaust to underground miner cohorts were carefully examined in the NAS reports on radon risks (NAS 1988, 1999a) and other studies. For example, in the Malmberget iron miner study, Radford and St. Clair Renard (1984) investigated and determined that the risk from confounders such as tuberculosis, dust, silica, diesel exhaust, metals and asbestos is negligible. Edling and Axelson (1983) found the Grangeberg mine atmosphere clean of arsenic, asbestos and carcinogenic metals. In the Eldorado miner cohort (NAS 1988), potential confounders were investigated and exposures to silica and diesel exhaust were very low. In the Czechoslovakian uranium miners' study, Sevc et al. (1984, 1988) found that cigarette smoking was the only risk factor other than radon that was a significant exogenic carcinogenic agent. Two of the studies (China and Ontario) have quantitative data on arsenic, and there was no significant variation in excess relative risk per unit radon exposure across different levels of arsenic exposure (NAS 1999a). Despite the variety of exposures to potentially toxic agents other than radon, the dose-response between radon and lung cancer death was approximately consistent across the mining cohorts. NAS (1988) also noted that animal studies show no evidence of a synergistic effect of these agents on lung cancer risk from radon. Taken together, these findings indicate that the effect of confounding factors on observed lung cancer rates in miners is likely to be small.

*Radon-smoking interaction:* Several commenters stated that EPA's analysis shows that smoking acts synergistically with radon to induce lung cancer. The risk from radon is, on average, ten times higher for smokers than for the rest of the population, and over 20 times higher for heavy smokers. Several commenters asked why they should spend resources to remove a natural contaminant from water while more than ⅔ of the related cancer risk is attributable to the subpopulation who smoke.

*EPA Response:* Because of the strong influence of smoking on the risk from radon, the BEIR VI committee (NAS 1999a) evaluated risk to ever-smokers and never-smokers separately. The BEIR VI committee had smoking information on five of the miner cohorts, from which they concluded that there was a submultiplicative interaction between radon and smoking in causing lung cancer. Based on current smoking prevalence rates, it is estimated that about 84 percent of all radon-induced lung cancers will occur in ever-smokers, with only 16 percent in never-smokers. Thus, it is true that a reduction in radon exposure will save more cancer cases in the cohort of smokers than nonsmokers, but the relative amount of risk reduction is actually greater for nonsmokers than smokers.

*Epidemiological studies of lung cancer in the home environment.* Some commenters stated that in estimating risk associated with exposure to radon, EPA should consider health risk data associated with the exposure to low levels of radon in the domestic environment.

*EPA Response:* The NAS (1999a) has recently performed a careful analysis of epidemiological data on the risk of cancer in residents from radon. The NAS committee concluded that because of numerous design and experimental limitations, these studies do not constitute an adequate data base from which quantitative risk estimates can be derived. However, the data from studies in residents are considered to be generally consistent with the predictions based on the miner data.

*Lack of experimental or epidemiological data link exposure via ingestion to increased cancer rates:* Several commenters stated that no experimental or epidemiologic data link exposure via ingestion to increased cancer rates. The basis for ingestion risk data was a surrogate gas, xenon-133, that behaves similarly to radon.

*EPA Response:* Although no human or animal data directly demonstrate cancer risk from ingestion of radon, it is certain that ingested radon is absorbed from the gastrointestinal tract into the body, that this absorbed radon is distributed to internal tissues which are then irradiated with alpha particles as the radon and its progeny undergo decay. That alpha irradiation increases cancer risk is well established (UNSCEAR 1988; NAS 1990).

EPA's ingestion risk estimate is based on the conclusions from the NAS Radon in Drinking Water committee (NAS 1999b). The NAS committee performed a re-evaluation of the risks from ingestion of radon in direct tap water using the basic approach described in Federal Guidance Document 13 (USEPA 1998). This involved developing a new pharmacokinetic model of the behavior of ingested radon, based primarily on observations of the behavior of ingested radon in humans, as well as studies using xenon and other noble gases. NAS also addressed the uncertainties (within an order of magnitude) of the risk estimates for oral exposure associated with dose estimate to the stomach and in the epidemiologic data used to estimate the risk (NAS 1999b). Because the magnitude of the risk posed by ingestion is about 10 percent of the risk from inhalation of radon progeny, these uncertainties are not most critical in evaluating the overall hazards from water-borne radon.

*Air-water transfer factor and episodic exposure:* As for inhalation exposure, most commenters supported EPA's proposed radon water-to-air transfer ratio of 10,000:1. Two commenters regarded this transfer factor as too conservative.

*EPA Response:* EPA has performed a detailed evaluation of radon gas transfer from water to air (USEPA 1993, 1995). Values are highly variable between buildings, with an average value of about 1E–04. The NAS has recently performed an independent review of both measured and modeled values, and the NAS committee also concluded that a value of 1E–04 is the best point estimate available (NAS 1999b).

*Outdoor versus indoor radon concentrations:* Some commenters asserted that the concentration of radon in outdoor air is higher than the indoor air concentration resulting from the proposed MCL of 300 pCi/L.

*EPA Response:* EPA agrees. The NAS committee reviewed all the ambient radon concentration data that are available, and based on these data concluded that the best estimate of the average ambient (outdoor) radon concentration in the United States is 0.4 pCi/L of air. In contrast, based on a transfer factor of $1\times10^{-4}$, the contribution to indoor air from an average radon concentration in water (about 213 pCi/L) is only about 0.021 pCi/L. However, some groundwater systems have much higher radon concentrations, and increments in indoor air from water-borne radon may be much higher in those cases. As required by the Congress. EPA is implementing the MMM program to address the issue of relative radon risk from water and air.

*Direct tap water ingestion rate:* Concerning ingestion intake, few commenters expressed an opinion on the direct tap water ingestion rate of 1 L/day. One commenter suggested that the intake assumption should be 0.7 L/day, and another, 0.25 L/day.

*EPA Response:* EPA has based its current assessment of this issue on reports by the National Academy of Sciences and others. The reader is referred to a fuller discussion in the preamble to today's proposed radon in drinking water regulation and to references cited therein (see Section XII).

*Radon loss via volatilization prior to ingestion:* Two commenters felt that the 20 percent radon loss from direct tap water before ingestion is conservative.

*EPA Response:* Data are limited on the amount of radon lost from direct tap water before ingestion. Several studies (von Doblin and Lindell 1964; Hursh 1965; Suomela and Kahlos 1972; Gesell and Prichard 1980; Horton 1982) suggest a value of about 20 percent as the central estimate of radon lost before direct ingestion. Because of the lack of data, the NAS (1999b) recommended that a value of 0 percent (i.e., no loss) be assumed. It is important to note that this applies only to ''direct tap water'', and that radon loss is assumed to be nearly complete from other types of water (coffee, juice, that in foods, etc.).

Concerning the potential additional loss from the stomach prior to absorption, EPA believes that radon does not escape from the esophagus. An available study (Correia et al. 1987) conducted by the Massachusetts General Hospital specifically measured exhaled air following ingestion of radioactive xenon in drinking water. Gas did not immediately escape through the mouth. However, the absorption through the stomach and small intestine transferred xenon to the bloodstream and lungs. The pharmacokinetic model used to evaluate risk from ingested radon utilizes this absorption mechanism.

*New studies indicating reduced lung cancer risk:* Some commenters asserted that the lung cancer risk estimates will be reduced based on new studies.

*EPA Response:* The risk coefficients for lung cancer derived by NAS (1999a, 1999b) are based on a detailed analysis of all of the currently available studies.

*Relative risk of radon from soil versus radon from drinking water:* Many commenters stated that the risks posed by radon in water are small compared to the risk of radon from soil, and that regulation of radon in water will have very little effect in reducing the total risk of cancer from radon exposure.

*EPA Response:* EPA recognizes that the risk to residents contributed by radon in household water is a relatively small fraction of the risk contributed by radon released into indoor air from soil. Based on the most recent quantitative analysis, NAS estimates that this fraction is only about 1 percent. Nevertheless, it is still true that radon in water is one of the most hazardous substances in public water systems, contributing a total of about 160–170 cancer deaths per year. Thus, regulation of radon in water is appropriate.

*Cancer risk posed by radon in drinking water:* Radon in drinking water is one of the water contaminants with the highest estimated cancer risk.

*EPA Response:* EPA agrees, and it is for this reason that EPA believes that regulation of radon in water is necessary and appropriate. By definition, because radon is a known human carcinogen, the MCLG is zero.

**E. Maximum Contaminant Level**

*Opposition to a radon MCL of 300 pCi/L:* More than 300 commenters representing trade associations, Federal and State agencies, and regional and community water suppliers disagreed with a standard of 300 pCi/L for radon in drinking water. The strongest opposition came from California, Nebraska, and the northeastern region of the United States. Other commenters suggested the MCL be set at 1,000 pCi/L or at 2,000 pCi/L.

*EPA Response:* As referenced in Section A of this Appendix, the SDWA as amended in 1996 provides EPA authority to utilize an alternative approach (AMCL with MMM programs), which is expected to significantly allay concerns of stakeholders and commenters on the 1991 proposal.

*Use of cost-effectiveness in standard setting:* Local water agencies throughout California and elsewhere in the United States insisted that water rates would double, resulting in economic problems. State and local water agencies were in almost unanimous agreement that the proposed standard may not be cost-effective, posing significant financial and administrative burdens on agencies and customers.

*EPA Response:* In the past, EPA generally limited consideration of economic costs under the SDWA to whether a treatment technology was affordable for large public water systems. Under the SDWA as amended in 1996, the Agency has conducted considerable analysis in the areas of cost and technologies for small systems implementing the radon MCL and on small system compliance technologies. (For more information on related EPA analyses refer to today's proposal.)

The MCL as proposed in 1991 and in today's action was set within the EPA regulatory target range of approximately $10^{-4}$ to $10^{-6}$ individual lifetime fatal cancer risk level, to ensure the health and safety of the country's drinking water supply. Although this level will prevent numerous fatal cancer cases per year, the Agency recognizes that this benefit would affect only radon in ground water or 5 percent of the total radon exposure. The Agency expects the proposed AMCL/ multimedia approach will result in greater radon risk reduction at lower cost. (The multimedia mitigation program and the projected costs and benefits are described in greater detail in today's proposal.)

*Impact on private wells:* Several commenters expressed concern over the potential impact of the proposed standards on private wells.

*EPA Response:* The Agency cannot comment on the impact of an NPDWR (radon standard) on private wells. EPA currently possesses some data from State surveys that indicate relatively high levels of radon in private wells. However, the data are distinct from Public Water System data collected by EPA and others. The statute regulates public water systems that provide piped water for human consumption to at least 15 service connections or that serve an average of at least 25 people for at least 60 days each year. Public water systems can be community; non-transient, non-community; or transient non-community systems. As a supplement to Federal coverage, some States extend their authority by regulating systems serving 10 people or fewer.

**F. Analytical Methods**

*Availability of qualified laboratories and personnel:* Commenters stressed the impact the proposed regulation may have on requirements for analytical laboratory certification and training of laboratory technicians. For example, one State wrote that it has no certification process through which laboratories can receive State certification for radionuclide analyses. Another commenter stressed the need for a strategy to work with individual States to ensure sufficient certified analytical laboratory capacity.

*EPA Response:* The current situation and expected changes in the processes governing laboratory approval and certification are discussed in some detail in today's preamble (Section VIII.B). One of the changes since 1991 is the formation of the National Environmental Laboratory Accreditation Conference (NELAC) in 1995. NELAC serves as a voluntary national standards-setting body for environmental laboratory accreditation, and includes members from both state and Federal regulatory and non-regulatory programs having environmental laboratory oversight, certification, or accreditation functions. The members of NELAC meet bi-annually to develop consensus standards through its committee structure. These consensus standards are adopted by participants for use in their own programs in order to achieve a uniform national program in which environmental testing laboratories will be able to receive one annual accreditation that is accepted nationwide. The intent of the NELAC standards setting process is to ensure that the needs of EPA and State regulatory programs are satisfied in the context of a uniform national laboratory accreditation program. EPA shares NELAC's goal of encouraging uniformity in standards between primacy States regarding laboratory proficiency testing and accreditation.

*Four-day holding period between sampling and analysis:* Several commenters contended that for laboratories to cope with the increased number of samples, the holding period should increase to eight days. A State agency suggested a holding period of seven days. Another commenter stated that the proposed four-day holding period was not possible because many ground water systems have sources distributed over large areas that may need sampling. Certified personnel will collect, record, package, and send the samples to analytical laboratories within four days. Also, with a 100-minute counting time requirement, commercial laboratories may be ill-equipped to analyze samples from 28,000 systems. Another State commented that the four-day holding period was not compatible with a standard work week.

*Response:* Standard Method 7500–Rn reports a 50 minute counting time (not 100 minutes) and a four day sample holding time. This combination of counting time and holding time has been determined to be a good trade-off, given the limitation of the 3.8 day half-life of radon. Doubling the sample holding time (i.e., eight days) would approximately triple the counting time (i.e., to 150 minutes) necessary to achieve the same level of certainty in the analytical results, which would probably result in much higher analytical costs. Since the sample counting procedure is capable of being highly automated, EPA believes that certified laboratories will be able to process the required samples with a four-day holding time. As an example, one laboratory contacted by EPA currently analyzes radon in 12,000 water samples per year as part of a ground water monitoring study, providing evidence that a demand for radon analytical capacity will result in the required laboratory capacity. Based on an evaluation of the potential for laboratory certification, performance testing, and analytical procedures, which included input from stakeholders, the four day holding time has been determined to be feasible, and should result in lower analytical costs than a longer holding time and a longer counting time.

*Proposed analytical techniques:* A commenter representing a group of utilities approved of direct, low-volume liquid scintillation for measurement of radon as proposed, but recommended the use of Lucas Cell de-emanation for measurement of Ra–226 (not also for radon, as proposed). According to this commenter, the liquid scintillation method for radon measurement is straightforward and efficient compared with the Lucas Cell method that requires a high degree of specialized skill. Also, equipment cost for the Lucas Cell method may be prohibitive. The Conference of Radiation Control Program Directors stated that liquid scintillation, while able to detect radon in water at low levels, may provide laboratory results that are not reliable.

*EPA Response:* EPA agrees that LSC has the stated advantages relative to de-

emanation. EPA also expects that the vast majority of nationwide radon analysis will be done using LSC. However, some laboratories are already equipped to perform the de-emanation method. Since the de-emanation method performs acceptably well, there is no reason to refuse the possibility of the added laboratory capacity afforded by the approval of this method.

*Precision variability:* A local water agency and an engineering company representative stated that the 30% precision variability is inadequate for determining compliance because of the extensive natural variability in radon levels over time. The combination of counting error, sampling error, and holding time variability demands a precision of ±20%, which would lead to more consistent data.

*EPA Response:* EPA agrees that the 1991 proposal of an acceptance level of ± 30%, based on a radon ''practical quantitation level'' (PQL) of 300 pCi/L is not supportable. This conclusion is based on an extensive collaborative study of the liquid scintillation method and the de-emanation method for radon published by EPA in 1993, as described in the methods section (VIII.b) of the preamble to this proposal. Today's proposal contains several options for ensuring that compliance monitoring is performed using radon methods with acceptable accuracy and precision. Based on other comments to the 1991 radionuclides proposal, EPA's preferred option is that the method detection limit (MDL) be used as the measure of sensitivity for radon, and not a PQL, consistent with the use of the MDL as the basis for sensitivity in the current radionuclides rule. EPA is proposing a value of 12 ± 12 pCi/L as the MDL for radon.

Based on the collaborative study data, EPA's best recommendation for acceptance limits for performance evaluations is ± 5% for single measurements, and for triplicate measurements, ± 6% at the 95% confidence level, and ± 9% at the 99% confidence level.

**G. Treatment Technologies and Cost**

*Water Treatment Costs:* Industry groups and several utilities provided detailed analyses of unit treatment costs for removal of radon in water. Water treatment cost estimates prepared by a consultant were up to five times the costs estimated by EPA. An analysis produced by a consultant showed that among the different factors influencing annual compliance costs estimated by them, unit treatment costs have the largest impact.

*EPA Response:* EPA disagrees that its radon aeration treatment estimates supporting the 1991 radionuclides proposal were under-estimates. EPA analyzed the aeration cost model and the cost elements put forward by the industry commenters and summarized the major differences between the EPA and industry models. This summary may be obtained from the docket supporting today's proposal (USEPA 1992). While this summary accounts for the differences in cost estimates between EPA and the industry and utility estimates, it is not necessary to go into detail regarding these differences since overwhelming evidence suggests that EPA's 1992 cost estimates were much closer to actual unit costs, based on costs reported in case studies collected since 1991 (USEPA 1999a, AWWARF 1998a) than the commenter's estimates. A comparison of EPA's current unit capital cost estimates to actual capital costs reported in published case studies can be found in Figure VIII.A.1 of this preamble. The consultant's 1991 estimates are compared against case studies and against EPA's current estimates in an EPA memorandum dated July 28, 1999 (USEPA 1999b). In summary, the consultant's estimates over-estimated the small systems case studies by factors ranging from three for small systems with design flows of around 1 MGD down to around 0.3 MGD. For the smallest systems case studies (systems serving around 0.015 MGD), the consultant's estimates were high by a factor of more than twenty. For large systems, the consultant's estimates were two to three times higher than the best fit for the large system case studies. As can be seen in Figure VIII.A.1 (''Total Capital Costs: Aeration Cost Case Studies''), EPA's current unit capital cost estimates appear to be very conservative compared to small systems case studies (systems with design flows less than 1 MGD) and are typical of case studies for larger flows (design flows greater than 1 MGD). It should be noted the costs reported for these case studies are total capital costs and include all process costs, as well as pre- and post-treatment capital costs, land, buildings, and permits. Figures VIII.A.1 through VIII.A.3 shown in the preamble provide strong evidence that EPA's assumptions affecting its unit cost estimates are realistic for large systems and are conservative for small systems.

*Additional Treatment—Disinfection:* Commenters asserted that some systems may need to add disinfection treatment to protect aerated water supplies from biological contamination. It was also stated that about 58 percent of small systems and 12 percent of large systems may need to add disinfection technology.

*EPA Response:* The current cost analysis assumes that all systems adding aeration and GAC will disinfect. For those systems not already disinfecting (proportions estimated from the EPA 1997 Community Water System Survey), it was assumed that systems adding treatment would also add disinfection.

*Pretreatment for Iron and Manganese:* A commenter also challenged EPA's position on the minimal pretreatment of a ground water supply before air stripping of radon. The commenter presumed that iron and manganese fouling will require additional treatment. While the comment did not address the costs to pre-treat water for iron and manganese removal, it was mentioned this pretreatment would result in high potential costs to water systems.

*EPA Response:* EPA has re-evaluated its assumptions regarding iron and manganese (Fe/Mn) fouling and has included costs for chemical stabilization (sequestration) of Fe/Mn for 25% of small systems and 15% of large systems. Based on an analysis of the occurrence of Fe/Mn in raw and finished ground water, EPA believes that this is adequate to account for Fe/Mn control. Data sources for this evaluation were: ''National Inorganics and Radionuclides Survey'' (NIRS); American Water Works Association, ''Water:/Stats, 1996 Survey: Water Quality''. and U.S. Geological Survey, ''National Water Information System''). This analysis is more fully discussed in Section VIII of the preamble. EPA reiterates that if its Fe/Mn cost assumptions were invalid, this fact would be demonstrated in comparisons of its estimates of capital and O&M costs against those reported in the case studies cited in the preamble. As described previously, EPA's unit cost estimates are apparently conservative for small systems and seem to be typical of large systems.

*Aeration as BAT and Use of Carbon Treatment:* A major commenter and a city in California asserted that aeration treatment for radon could potentially create a problem in air emissions permitting. Also, a major commenter commented that systems with high radon levels in water could produce high levels of radon in off-gas, potentially creating a shift among utilities to activated carbon treatment and waste (radioactive) disposal problems.

*EPA Response:* EPA discusses this concern in some detail in Section VIII of the preamble, including an evaluation of the estimates of the potential risks. Results from a survey of nine California air permitting agencies regarding permitting requirements and costs for radon treatment is also described in the preamble. The full text of this survey is reported in EPA 1999a.

*Centralized Treatment Assumption:* Commenters from the regulated community challenged EPA's cost analysis assumption involving centralized water treatment for radon. These associations cited the then-current EPA Community Water Supply Survey of 1986 and the then-current Water Industry Database. They suggested centralized treatment facilities were unrealistic and under predicts the costs to public water systems. The industry asserted that the number of wells and well groupings per system (with numbers increasing with increasing system size) will likely determine the number of treatment sites. An industry group produced estimated distributions of the percent of systems that would require treatment sites.

*EPA Response:* Centralized treatment was not assumed in the current radon cost analysis. EPA's current estimate of national compliance costs for the proposed radon rule uses the distribution of wells (treatment sites) per ground water system as a function of water system size from the 1997 Community Water System Survey (USEPA 1997). EPA assumed that a given system's total flow would be evenly distributed between the total number of wells at the system. To estimate the radon occurrence at a particular well within a system with multiple wells, EPA used its evaluation of intra-system occurrence variability (the variability of radon occurrence between wells within a given system) to estimate individual well radon levels. If multiple wells were predicted to be impacted at a given system, the cost model assumes that treatment is installed at each well requiring treatment.

*Integrated approach to waste management:* Three commenters declared that compliance with the radionuclides rule will create radioactive waste that may or may not be

disposable. They recommended an integrated environmental management approach in addressing this waste issue.

*EPA Response:* The Agency used an integrated environmental management approach to determine BAT in removing contaminants from drinking water. While Packed Tower Aeration (PTA), the BAT for radon, does not generate waste requiring disposal, granular activated carbon is of concern. While not BAT, granular activated carbon may be used by very small systems to remove radon. Waste disposal issues regarding GAC treatment for radon are discussed in some detail in Section VIII of this preamble. For more information, see NAS 1999b and AWWARF 1998a and AWWARF 1998b.

**H. Compliance Monitoring**

*Sampling location:* Four State environmental/health agencies, one private non-environmental firm, eight public water suppliers, and one water association suggested that radon sampling of the distribution system at the point of entry does not allow systems to account for decay and aeration of radon during distribution. According to these commenters, sampling is more effective closer to the point of use.

*EPA Response:* EPA's proposal requires sampling at the entry points to the distribution system to assure compliance with the MCL for the water delivered to every customer. All samples will be required to be finished water, as it enters the distribution system after any treatment and storage. This approach allows systems to account for the decay and aeration of radon during treatment and storage before it enters the distribution system and at the same time offers maximum protection to the consumer. It is expected that radon levels would progressively decrease within the distribution system, downstream from the point of entry. Therefore, consumers who are located closest to the point of entry are exposed to higher levels of radon that those further downstream. In order to assure maximum protection to all of the consumers, EPA requires sampling at the entry points to the distribution system.

*Compliance period:* Clarification concerning the frequency of compliance periods, specifically in regards to the specific timing for the commencement of water systems monitoring is warranted.

*EPA Response:* The proposed monitoring requirements for radon are consistent with the monitoring requirements for regulated drinking water contaminants, as described in the Standardized Monitoring Framework (SMF) promulgated by EPA under the Phase II Rule of the National Primary Drinking Water Regulations (NPDWR) and revised under Phases IIB and V. The goal of the SMF is to streamline the drinking water monitoring requirements by standardizing them within contaminant groups and by synchronizing monitoring schedules across contaminant groups.

Systems already on-line must begin initial monitoring for compliance with the MCL/AMCL by the compliance dates specified in the rule (i.e., 3 years after the date of promulgation or 4.5 years after the date of promulgation). New sources connected on-line must satisfy initial monitoring requirements.

Initial compliance with the MCL/AMCL will be determined based on an average of 4 quarterly samples taken at individual sampling points in the initial year of monitoring. Systems with averages exceeding the MCL/AMCL at any well or sampling point will be deemed to be out of compliance. Systems exceeding the MCL/AMCL will be required to monitor quarterly until the average of 4 consecutive samples are less than the MCL/AMCL. Systems will then be allowed to collect one sample annually if the average from four consecutive quarterly samples is less than the MCL/AMCL and if the State determines that the system is reliably and consistently below MCL/AMCL.

*Systems that primarily use surface water, supplemented with ground water:* One water association suggested that public water systems supplementing their surface water supply with ground water are not in violation. Since the actual lifetime risk involved is significantly lower than those systems using 100 percent ground water supply, an equitable method of compliance for this type of combined systems should be administered.

*EPA Response:* In today's proposal, systems relying exclusively on surface water as their water source are not required to sample for radon. Systems that rely in part on ground water during low-flow periods about one quarter of the year are considered public ground water systems. According to the ground water monitoring requirements, systems are subject to monitor finished water at each entry point to the distribution system for radon during periods of ground water use. For the purpose of determining compliance, systems supplementing their surface water during part of the year will use a value of ½ the detection limit for radon for averaging purposes for the quarters when the water system is not supplemented by ground water. The water system having ground water samples supplementing surface water with a radon detection level above the MCL would not be out of compliance provided that these samples do not cause the average to exceed the MCL when averaged with the value of ½ the detection limit during the quarters the ground water source is not in use.

*Averaging quarterly samples:* Commenters recommended clarifying the discussion concerning the averaging of initial measurements to determine compliance. They stated that averaging the first year quarterly samples with the annual second and third compliance years will defeat the purpose of quarterly samples detecting signs of seasonal variability.

*EPA Response:* EPA is retaining the quarterly monitoring requirement for radon as proposed initially in the 1991 proposal to account for variations such as sampling, analytical and temporal variability in radon levels. Results of analysis of data obtained since 1991, estimating contributions of individual sources of variability to overall variance in the radon data sets evaluated, indicated that sampling and analytical variance contributes less than 1 percent to the overall variance. Temporal variability within single wells accounts for between 13 and 18 percent of the variance in the data sets evaluated, and a similar proportion (12–17 percent) accounts for variation in radon levels among wells within systems (USEPA 1999c).

For today's proposal, the Agency performed additional analyses to determine whether the requirement of initial quarterly monitoring for radon was adequate to account for seasonal variations in radon levels and to identify non-compliance with the MCL/AMCL. Results of analysis based on radon levels modeled for radon distribution for ground water sources and systems (USEPA 1999c) in the U.S. show that the average of the first four quarterly samples provides a good indication of the probability that the long-term average radon level in a given source would exceed an MCL or AMCL. Tables A.1 and A.2 show the probability of the long-term average radon level exceeding the MCL and AMCL at various averages obtained from the first four quarterly samples from a source.

TABLE A.1.—THE RELATIONSHIP BETWEEN THE FIRST-YEAR AVERAGE RADON LEVEL AND THE PROBABILITY OF THE LONG-TERM RADON AVERAGE RADON LEVELS EXCEEDING THE MCL

| If the average of the first four quarterly samples from a source is: | Then the probability that the long-term average radon level in that source exceeds 300 pCi/L is: |
|---|---|
| Less than 50 pCi/L ..... | 0 percent |
| Between 50 and 100 pCi/L ..... | 0.5 percent |
| Between 100 and 150 pCi/L ... | 0.4 percent |
| Between 150 and 200 pCi/L ... | 7.2 percent |
| Between 200 and 300 pCi/L ... | 26.8 percent |

TABLE A.2.—THE RELATIONSHIP BETWEEN THE FIRST-YEAR AVERAGE RADON LEVEL AND THE PROBABILITY OF THE LONG-TERM RADON AVERAGE RADON LEVELS EXCEEDING THE AMCL

| If the average of the first four quarterly samples from a source is: | Then the probability that the long-term average radon level in that source exceeds 4000 pCi/L is: |
|---|---|
| Less than 2,000 pCi/L ..... | Less than 0.1 percent |
| Between 2,000 and 2,500 pCi/L. | 9.9 percent |
| Between 2,500 and 3,000 pCi/L. | 15.1 percent |
| Between 3,000 and 4,000 pCi/L. | 32.9 percent |

*Water systems with a history of compliance:* EPA has provided for the grandfathering of prior monitoring data for granting waivers. Monitoring data collected after January 1, 1985, that are generally consistent with the requirements of the section, and includes at least one sample taken on or after January 1, 1993, may be accepted by the State to satisfy the initial monitoring requirements. Many systems meeting the current monitoring requirements should qualify for this grandfathering provision because each sampling point or source water intake will be monitored within the preceding four-year period. New sampling points, or sampling points with new sources, must take an initial sample within the year the new source or sampling point begins operation.

*EPA Response:* Today's proposal provides that at a State's discretion, sampling data collected after the proposal could be used to satisfy the initial sampling requirements for radon, provided that the system has conducted a monitoring program not less stringent than that specified in the regulation and used analytical methods specified in the proposed regulation. The Agency wants to provide water suppliers with the opportunity to synchronize their monitoring program with other contaminants and to get an early start on their monitoring program if they wish to do so.

The proposed regulation provides for the States to grant monitoring waiver reducing monitoring frequency to once every nine years (once per compliance cycle) provided the system demonstrates that it is unlikely that radon levels in drinking water will occur above the MCL/AMCL. In granting the waiver, the State must take into consideration factors such as the geological area where the water source is located, and previous analytical results which demonstrate that radon levels do not occur above the MCL/AMCL. The waiver will be granted for up to a nine year period. (Given that all previous samples are less than ½ the MCL/AMCL, then it is highly unlikely that the long-term average radon levels would exceed the MCL/AMCL.)

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**List of Subjects**

*40 CFR Part 141*

Environmental protection, Chemicals, Indians—lands, Intergovernmental relations, Radiation protection, Reporting and recordkeeping requirements, Water supply.

*40 CFR Part 142*

Environmental protection, Administrative practice and procedure, Chemicals, Indians—lands, Radiation protection, Reporting and recordkeeping requirements, Water supply.

Dated: October 19, 1999.

**Carol M. Browner,**

*Administrator.*

For the reasons set out in the preamble, the Environmental Protection Agency proposes to amend 40 CFR parts 141 and 142 as follows:

## PART 141—NATIONAL PRIMARY DRINKING WATER REGULATIONS

1. The authority citation for part 141 continues to read as follows:

**Authority:** 42 U.S.C. 300f, 300g–1, 300g–2, 300g–3, 300g–4, 300g–5, 300g–6, 300j–4, 300j–9, and 300j–11.

2. Section 141.2 is amended by adding definitions of ''Alternative Maximum Contaminant Level (AMCL)'' and ''Multimedia Mitigation (MMM) Program Plan'' in alphabetical order, to read as follows:

**§ 141.2 Definitions.**

* * * * *

*Alternative Maximum Contaminant Level* (AMCL) is the permissible level of radon in drinking water delivered by a community water system in a State with an EPA-approved multimedia mitigation (MMM) program plan, or by a community water system with a State-approved local MMM program plan.

* * * * *

*Multimedia Mitigation (MMM) Program Plan* is a State or community water system program plan of goals and strategies developed with public participation to promote indoor radon risk reduction. MMM programs for radon in indoor air may use a variety of strategies, including public education, testing, training, technical assistance, remediation grant and loan or incentive programs, or other regulatory or non-regulatory measures.

* * * * *

3. Section 141.6 is amended by adding paragraph (j) to read as follows:

**141.6 Effective dates.**

* * * * *

(j) The regulations set forth in Subpart R of this part are effective [60 days after date of publication of the final rule in the **Federal Register**].

## Subpart C—[Amended]

4. A new § 141.20 is added to Subpart C to read as follows:

**§ 141.20 Analytical methods, monitoring, and compliance requirements for radon.**

(a) *Analytical methods.* (1) Analysis for radon shall be conducted using one of the methods in the following table:

PROPOSED ANALYTICAL METHODS FOR RADON IN DRINKING WATER

| Methodology | References (method or page number) | | |
|---|---|---|---|
| | SM | ASTM | EPA |
| Liquid Scintillation Counting | 7500–Rn[1] .... | D 5072 92[2] | |
| De-emanation | ..... | ..... | EPA 1987[3] |

[1] *Standard Methods for the Examination of Water and Wastewater.* 19th Edition Supplement. Clesceri, L., A. Eaton, A. Greenberg, and M. Franson, eds. American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, DC. 1996.

[2] American Society for Testing and Materials (ASTM). Standard Test Method for Radon in Drinking Water. Designation: D 5072–92. *Annual Book of ASTM Standards.* Vol. 11.02. 1996.

[3] Appendix D, Analytical Test Procedure, ''The Determination of Radon in Drinking Water''. In ''Two Test Procedures for Radon in Drinking Water, Interlaboratory Collaborative Study''. EPA/600/2–87/082. March 1987. p. 22.

(2) Sample collection for radon shall be conducted using the sample preservation, container, and maximum holding time procedures specified in the following table.

SAMPLING METHODS AND SAMPLE HANDLING, PRESERVATION, AND HOLDING TIME

| Sampling methods | Preservative | Sample Container | Maximum holding time for sample |
|---|---|---|---|
| (i) As described in SM 7500–Rn[1] ..... | Ship sample in an insulated package to avoid large temperature changes. | Glass with teflon-lined septum. | 4 days. |

Sampling Methods and Sample Handling, Preservation, and Holding Time

| Sampling methods | Preservative | Sample Ccntainer | Maximum holding time for sample |
|---|---|---|---|
| (ii) As described in EPA 1987 [2]. | | | |

[1] *Standard Methods for the Examination of Water and Wastewater.* 19th Edition Supplement. Clesceri, L., A. Eaton, A. Greenberg, and M. Franson, eds. American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, DC. 1996.

[2] "Two Test Procedures for Radon in Drinking Water, Interlaboratory Collaborative Study". EPA/600/2–87/082. March 1987.

*(b) Monitoring and compliance requirements.* Community water systems (CWSs) shall conduct monitoring to determine compliance with the maximum contaminant level (MCL) or alternate maximum contaminant level (AMCL) specified in § 141.66 in accordance with this chapter. The monitoring requirements have been developed to be consistent with the Phase II/V monitoring schedule.

*(1) Applicability and sampling location.* CWSs using a ground water source or CWSs using ground water and surface water sources (for the purpose of this section hereafter referred to as systems) shall sample at every entry point to the distribution system which is representative of each well after treatment and/or storage (hereafter called a sampling point) under normal operating conditions in accordance with paragraph (b)(2) of this section.

*(2) Monitoring—(i) Initial monitoring requirements.* (A) Systems must collect four consecutive quarterly samples beginning by the date specified in § 141.301(b).

(B) States may allow previous sampling data collected after [60 days after date of publication of the final rule] to satisfy the initial monitoring requirements, provided the system has conducted monitoring to satisfy the requirements specified in this section. If a system's early monitoring data indicates an MCL/AMCL exceedence, the system will not be considered in violation until the end of the applicable initial monitoring period specified in § 141.301(b).

*(ii) Routine monitoring requirements.* Systems must continue quarterly monitoring until the running average of four consecutive quarterly samples is less than the MCL/AMCL. If the running average of four consecutive quarterly samples is less than the MCL/AMCL then systems may conduct annual monitoring at the State's discretion.

*(iii) Reduced monitoring requirements.* States may allow systems to reduce the frequency of monitoring to once every three years (one sample per compliance period) beginning the following compliance period provided the systems:

(A) Demonstrate that the average of four consecutive quarterly samples is below ½ MCL/AMCL;

(B) No individual samples exceed the MCL/AMCL; and

(C) The States determine that the systems are reliably and consistently below the MCL/AMCL.

*(iv) Increased monitoring requirements.* (A) Systems which exceed the MCL/AMCL shall monitor quarterly beginning the quarter following the exceedence. States may allow systems to reduce their monitoring frequency if the requirements specified in paragraph (b)(2)(iii) or (b)(2)(iv)(B) of this section are met.

(B) Systems monitoring once every three years, or less frequently, which exceed ½ MCL/AMCL shall begin annual monitoring the year following the exceedence. Systems may reduce monitoring to once every three years if the average of the initial and three consecutive annual samples is less than ½ MCL/AMCL and the State determines the system is reliably and consistently below the MCL/AMCL.

(C) If a community water system has a portion of its distribution system separable from other parts of the distribution system with no interconnections, increased monitoring need only be conducted at points of entry to those portions of system.

(v) Failure to conduct monitoring as described in this section is a monitoring violation.

*(3) Monitoring waivers.* (i) States may grant a monitoring waiver to systems provided that:

(A) The system has completed initial monitoring requirements as specified in paragraph (b)(2)(i) of this section. Systems shall demonstrate that all previous analytical results were less than ½ MCL/AMCL. New systems and systems using a new ground water source must complete four consecutive quarters of monitoring before the system is eligible for a monitoring waiver; and

(B) States determine that the systems are reliably and consistently below the MCL/AMCL, based on a consideration of potential radon contamination of the source water due to the geological characteristics of the source water aquifer.

(ii) Systems with a monitoring waiver must collect a minimum of 1 sample every nine-years (once per compliance cycle).

(iii) A monitoring waiver remains in effect until completion of the nine-year compliance cycle.

(iv) A decision by States to grant a monitoring waiver shall be made in writing and shall set forth the basis for the determination.

*(4) Confirmation samples.* Systems may take additional samples to verify initial sample results as specified by the State. The results of the initial and confirmation samples will be averaged for use in calculation of compliance.

*(5) Compliance.* Compliance with § 141.66 shall be determined based on the analytical result(s) obtained at each sampling point. If one sampling point is in violation, the system is in violation.

(i) For systems monitoring more frequently than annually, compliance with the MCL/AMCL is determined by a running annual average at each sampling point. If the average at any sampling point is greater than the MCL/AMCL, then the system is out of compliance with the MCL/AMCL.

(ii) If any one quarterly sampling result will cause the running average to exceed the MCL/AMCL, the system is out of compliance.

(iii) Systems monitoring annually or less frequently whose sample result exceeds the MCL/AMCL will revert to quarterly sampling immediately. The system will not be considered in violation of the MCL/AMCL until they have completed one year of quarterly sampling.

(iv) All samples taken and analyzed under the provisions of this section must be included in determining compliance, even if that number is greater than the minimum required.

(v) If a system does not collect all required samples when compliance is based on a running annual average of

quarterly samples, compliance will be based on available data.

(vi) If a sample result is less than the detection limit, zero will be used to calculate the annual average.

(vii) During the initial monitoring period, if the compliance determination for a system in a non-MMM State exceeds the MCL, the system will incur a MCL violation unless the system notifies the State by [four years after date of publication of the final rule in the **Federal Register**] of their intent to submit a local MMM plan, submits a local MMM plan to the State within [5 years after date of publication of the final rule in the **Federal Register**] and begins implementation by [5.5 years after date of publication of the final rule in the **Federal Register**]. The State shall approve or disapprove a local MMM program plan within 6 months from the date of receipt. If the State does not disapprove the local MMM program plan during such period, then the CWS shall implement the plan submitted to the State for approval. The compliance determination will be conducted as described in this paragraph.

(viii) Following the completion of the initial monitoring period, if the compliance determination for a system in a non-MMM State exceeds the MCL, the system will incur a MCL violation unless the system submits a local MMM plan to the State within 1 year from the date of the exceedence and begins implementation 1.5 years from the date of the exceedence. The State shall approve or disapprove a local MMM program plan within 6 months from the date of receipt. If the State does not disapprove the local MMM program plan during such period, then the CWS shall implement the plan submitted to the State for approval. The compliance determination will be conducted as described in this paragraph.

(6) If a community water system has a distribution system separable from other parts of the distribution system with no interconnections, the State may allow the system to give public notice to only the area served by that portion of the system which is out of compliance.

5. Section 141.28 is revised to read as follows:

**§ 141.28 Certified laboratories.**

(a) For the purpose of determining compliance with § 141.20 through 141.27, 141.41, and 141.42, samples may be considered only if they have been analyzed by a laboratory certified by the State except that measurements for turbidity, free chlorine residual, temperature and pH may be performed by any person acceptable to the State.

(b) Nothing in this part shall be construed to preclude the State or any duly designated representative of the State from taking samples or from using the results from such samples to determine compliance by a supplier of water with the applicable requirements of this part.

## Subpart F—[Amended]

6. A new § 141.55 is added to Subpart F to read as follows:

**§ 141.55 Maximum contaminant level goals for radionuclides.**

MCLGs are as indicated in the following table:

| Contaminant | MCLG |
|---|---|
| Radon–222 | Zero. |

## Subpart G—[Amended]

7. A new § 141.66 is added to Subpart G to read as follows:

**§ 141.66 Maximum contaminant level for radionuclides.**

(a) The maximum contaminant level for radon-222 is as follows: (1) A community water system (CWS) using a ground water source or using ground water and surface water sources that serves 10,000 or fewer people shall comply with the alternative maximum contaminant level (AMCL) of 4000 pCi/L, and implement a State-approved multimedia mitigation (MMM) program to address radon in indoor air (unless the State in which the system is located has a MMM approved by the Environmental Protection Agency). These systems may elect to comply with the MCL of 300 pCi/L instead of developing a local CWS MMM program plan.

(2) A CWS using a ground water source or using ground water and surface water sources that serves more than 10,000 people shall comply with the MCL of 300 pCi/L, except that the system may comply with an AMCL of 4000 pCi/L where:

(i) The State in which the CWS is located has adopted an MMM program plan approved by EPA; or,

(ii) The CWS has adopted an MMM program plan approved by the State.

(3) A CWS shall monitor for radon in drinking water according to the requirements in § 141.20, and report the results to the State, and continue to monitor as described in § 141.20. If the State determines that the CWS is in compliance with the MCL of 300 pCi/L, the CWS has met the requirements of this section and is not subject to the requirements of subpart R of this part, regarding MMM programs.

(4) The Administrator, pursuant to section 1412 of the Act, hereby identifies, as indicated in the following table, the best technology available for achieving compliance with the maximum contaminant levels for radon identified in paragraphs (a)(1) and (a)(2) of this section:

**BAT for Radon–222**

*High-Performance Aeration* [1]

(5) The Administrator, pursuant to section 1412 of the Act, hereby identifies in the following table the best technology available to systems serving 10,000 persons or fewer for achieving compliance with the MCL or AMCL. The table addresses affordability and technical feasibility for such BAT.

PROPOSED SMALL SYSTEMS COMPLIANCE TECHNOLOGIES (SSCTS) [1] AND ASSOCIATED CONTAMINANT REMOVAL EFFICIENCIES

| Small systems compliance technology | Affordable for listed small systems categories [2] | Removal efficiency | Operator level required [3] | Limitations (see footnotes) |
|---|---|---|---|---|
| Packed Tower Aeration (PTA) | All Size Categories | 90–>99.9% Removal | Intermediate | (a) |
| High Performance Package Plant Aeration (e.g., Multi-Stage Bubble Aeration, Shallow Tray Aeration). | All Size Categories | 90–> 99.9% Removal | Basic to Intermediate. | (a) |
| Diffused Bubble Aeration | All Size Categories | 70 to >99% removal | Basic | (a, b) |

[1] High Performance Aeration is defined as the group of aeration technologies that are capable of being designed for high radon removal efficiencies, i.e., Packed Tower Aeration, Multi-Stage Bubble Aeration and other suitable diffused bubble aeration technologies, Shallow Tray and other suitable Tray Aeration technologies, and any other aeration technologies that are capable of similar high performance.

PROPOSED SMALL SYSTEMS COMPLIANCE TECHNOLOGIES (SSCTS) [1] AND ASSOCIATED CONTAMINANT REMOVAL EFFICIENCIES—Continued

| Small systems compliance technology | Affordable for listed small systems categories [2] | Removal efficiency | Operator level required [3] | Limitations (see footnotes) |
|---|---|---|---|---|
| Tray Aeration | All Size Categories | 80 to >90% | Basic | (a, c) |
| Spray Aeration | All Size Categories | 80 to >90% | Basic | (a, d) |
| Mechanical Surface Aeration | All Size Categories | >90% | Basic | (a, e) |
| Centralized granular activated carbon | May not be affordable, except for very small flows. | 50 to >99% Removal | Basic | (f) |
| Point-of-Entry (POE) granular activated carbon | May be affordable for systems serving fewer than 500 persons. | 50 to >99% Removal | Basic | (f, g) |

[1] Section 1412(b)(4)(E)(ii) of the SDWA specifies that SSCTs must be affordable and technically feasible for small systems.
[2] The Act (ibid.) specifies three categories of small systems: i) those serving 25 or more, but fewer than 501, ii) those serving more than 500, but fewer than 3,301, and iii) those serving more than 3,300, but fewer than 10,001.
[3] From National Research Council. *Safe Water from Every Tap: Improving Water Service to Small Communities.* National Academy Press. Washington, DC. 1997. Limitations: a) Pre-treatment to inhibit fouling may be needed. Post-treatment disinfection and/or corrosion control may be needed. b) May not be as efficient as other aeration technologies because it does not provide for convective movement of the water, which reduces the air:water contact. It is generally used in adaptation to existing basins. c) Costs may increase if a forced draft is used. Slime and algae growth can be a problem, but may be controlled with chemicals, e.g., copper sulfate or chlorine. d) In single pass mode, may be limited to uses where low removals are required. In multiple pass mode (or with multiple compartments), higher removals may be achieved. e) May be most applicable for low removals, since long detention times, high energy consumption, and large basins may be required for larger removal efficiencies. f) Applicability may be restricted to radon influent levels below around 5000 pCi/L to reduce risk of the build-up of radioactive radon progeny. Carbon bed disposal frequency should be designed to allow for standard disposal practices. If disposal frequency is too long, radon progeny, radium, and/or uranium build-up may make disposal costs prohibitive. Proper shielding may be required to reduce gamma emissions from the GAC unit. GAC may be cost-prohibitive except for very small flows. g) When POE devices are used for compliance, programs to ensure proper long-term operation, maintenance, and monitoring must be provided by the water system to ensure adequate performance.

## Subpart O—[Amended]

8. Section 141.151 is amended by revising paragraph (d) to read as follows:

**141.151 Purpose and applicability of this subpart.**

* * * * *

(d) For the purpose of this subpart, *detected* means: at or above the levels prescribed by § 141.23(a)(4) for inorganic contaminants, at or above the levels prescribed by § 141.24(f)(7) for the contaminants listed in § 141.61(a), at or above the level prescribed by § 141.24(h)(18) for the contaminants listed in § 141.61(c), at or above the level prescribed by § 141.66 for radon, and at or above the levels prescribed by § 141.25(c) for radioactive contaminants.

* * * * *

9. Section 141.153 is amended by revising paragraph (d)(1)(i); removing paragraph (e)(2) and redesignating paragraph (e)(3) as (e)(2); redesignating paragraphs (f)(5), (f)(6), and (f)(7) as (f)(6), (f)(7), and (f)(8); and adding paragraph (f)(5) to read as follows:

**§ 141.153 Content of the reports.**

* * * * *

(d) * * *

(1) * * *

(i) Contaminants subject to a MCL, AMCL, action level, or treatment technique (regulated contaminants);

* * * * *

(f) * * *

(5) Local multimedia radon mitigation programs prescribed by subpart R of this part.

* * * * *

10. Section 141.154 is amended by adding paragraph (f) as follows:

**§ 141.154 Required additional health information.**

* * * * *

(f) In each complete calendar year between [date of publication of final rule in the **Federal Register**] and [4 years after date of publication of the final rule in the **Federal Register**], each report from a system that has ground water as a source must include the following notice (except that a system developing a local MMM program in a non-MMM State needs to include this statement in each calendar year between [date of publication of the final rule in the **Federal Register**] and [5 years after date of publication of the final rule in the **Federal Register**] :

Radon is a naturally-occurring radioactive gas found in soil and outdoor air that may also be found in drinking water and indoor air. Some people exposed to elevated radon levels over many years in drinking water may have an increased risk of getting cancer. The main health risk is lung cancer from radon entering indoor air from soil under homes. Your water system plans to test for radon by [insert date], and if radon is detected your water system will provide the results of testing to their customers. The best way to reduce the overall risk from radon is to reduce radon levels in indoor air. Some States, and water systems, may now be working to develop a program to reduce radon exposure in indoor air and drinking water. To get more information and to help develop the program, call the Radon Hotline (800–SOS–RADON) or visit the web site http://www.epa.gov/iaq/radon/.

## Subpart Q—[Amended]

11. In § 141.201, Table 1 proposed on May 13, 1999, at 64 FR 25964 is amended by revising paragraphs (1) introductory text and (1)(i) to read as follows:

**§ 141.201 General Public Notification Requirements.**

* * * * *

Table 1 to § 141.201—Violation Categories and Other Situations Requiring a Public Notice.

(1) NPDWR violations (MCL/AMCL, local MMM, MRDL, treatment technique, monitoring and testing procedure)

(i) Failure to comply with an applicable maximum contaminant level (MCL), alternative maximum contaminant level (AMCL), the local multimedia mitigation requirement for small systems in non-MMM States, or maximum residual disinfectant level (MRDL).

* * * * *

12. In § 141.203, Table 1 proposed on May 13, 1999, at 64 FR 25964 is amended by revising paragraph (1) to read as follows:

**§ 141.203 Tier 2 Public Notice—Form, manner, and frequency of notice.**

* * * * *

Table 1 to § 141.203. Violation Categories and Other Situations Requiring a Tier 2 Public Notice

(1) All violations of the MCL, AMCL, MRDL, and treatment technique requirements not included in the Tier 1 notice category;

* * * * *

13. In § 141.204, Table 1 proposed on May 13, 1999, at 64 FR 25964 is amended by adding paragraph (5) to read as follows:

**§ 141.204. Tier 3 Public Notice—Form, manner, and frequency of notice.**

* * * * *

Table 1 to § 141.204. Violation Categories and Other Situations Requiring a Tier 3 Public Notice

(5) All violations of the MMM requirements not included in the Tier 1 or 2 notice category;

* * * * *

14. Section 141.205 proposed on May 13, 1999, at 64 FR 25964 is amended by revising paragraph (d)(1), to read as follows:

**§ 141.205 Content of the public notice.**

* * * * *

(d) * * *

(1) *Standard health effects language for MCL, AMCL, MMM or MRDL violations, treatment technique violations, and violations of the condition of a variance or exemption.* Public water systems must include in each public notice the health effects language specified in Appendix B to this subpart corresponding to each MCL, AMCL, MMM, MRDL, and treatment technique violation listed in Appendix A to this subpart, and for each violation of a condition of a variance or exemption.

* * * * *

15. Part 141 is amended by adding a new Subpart R to read as follows:

**Subpart R—Reducing Radon Risks In Indoor Air and Drinking Water**

Sec.



## Subpart R—Reducing Radon Risks in Indoor Air and Drinking Water

**§ 141.300 Applicability.**

(a) The requirements of this subpart constitute national primary drinking water regulations for radon. The provisions of this subpart apply to community water systems (CWS) using a ground water source or using ground water and surface water sources. CWSs must monitor for radon in drinking water according to the requirements described in § 141.20, and report the results to the State, and continue to monitor as described in § 141.20. If the State determines that the CWS is in compliance with the MCL of 300 pCi/L, the CWS has met the requirements of this section and is not subject to the requirements of this subpart.

(b) These regulations in this subpart establish criteria for the development and implementation of program plans to mitigate radon in indoor air and drinking water (multimedia mitigation or MMM program plan). In general, where a State, CWS, or Tribal MMM program plan is approved, CWSs comply with an AMCL of 4000 pCi/L (§ 141.66). In jurisdictions without an approved MMM program plan, large CWSs (serving greater than 10,000 people) must comply with an MCL of 300 pCi/L (§ 141.66), except they comply with the AMCL of 4000 pCi/L if they develop a CWS MMM program plan approved by the State. Small community water systems serving 10,000 or fewer people must comply with 4000 pCi/L and implement a State-approved multimedia mitigation program plan to address radon in indoor air (unless the State in which the system is located has a multimedia mitigation program plan approved by the Environmental Protection Agency); these systems have the option of complying with the MCL instead of implementing a MMM program.

**§ 141.301 General requirements.**

(a) The requirements for the MMM program plan are set out in this subpart. The requirements for the MCL are set out in § 141.20(a) (analytical methods), § 141.20(b) (monitoring and compliance), § 141.66(a) through (c) (requirements for systems, including MCL and AMCL), and § 141.66(d) (BAT).

(b) *Compliance dates.*—(1) *Initial monitoring.* (i) For States that submit a letter to the Administrator by [90 days after date of publication of the final rule in the **Federal Register**] committing to develop an MMM program plan in accordance with section 1412(b)(13)(G)(v) of the Act, CWSs must begin one year of quarterly monitoring for compliance with the AMCL by [4.5 years after date of publication of the final rule in the **Federal Register**].

(ii) For States not submitting a letter to the Administrator by [90 days after date of publication of final rule in the **Federal Register**] committing to develop an MMM program plan, CWSs must begin one year of quarterly monitoring for compliance with the MCL/AMCL by [3 years after date of publication of final rule in the **Federal Register**].

(2) *State-wide MMM programs.* (i) For States that submit a letter to the Administrator by [90 days after date of publication of the final rule in the **Federal Register**] committing to develop an MMM program plan in accordance with section 1412(b)(13)(G)(v), implementation of the State-wide MMM program must begin by [4.5 years after date of publication of the final rule in the **Federal Register**].

(ii) For States not submitting a letter to the Administrator by [90 days after date of publication of the final rule in the **Federal Register**] committing to develop an MMM program plan, but which subsequently decide to adopt the AMCL, implementation of the State-wide MMM program must begin by [3 years after date of publication of the final rule in the **Federal Register**].

(iii) If EPA-approval of a State MMM program plan is revoked, all systems have one year from notification by the State to comply with the MCL. If a system chooses to continue complying with the AMCL and develop and implement a local MMM program, the State will specify a timeframe for compliance.

*(3) Local MMM programs.* (i) During the initial monitoring period, if the compliance determination for a CWS in a non-MMM State exceeds the MCL, the CWS will incur an MCL violation unless the system notifies the State by [four years after date of publication of the final rule in the **Federal Register**] of their intent to submit a local MMM plan, submits a local MMM plan to the State within [5 years after date of publication of the final rule in the **Federal Register**] and begins implementation by [5.5 years after date of publication of the final rule in the **Federal Register**]. The compliance determination will be conducted as described in § 141.20(b)(2).

(ii) Following the completion of the initial monitoring period, if the compliance determination for a CWS in a non-MMM State exceeds the MCL, the system will incur an MCL violation unless the system submits a local MMM plan to the State within 1 year from the date of the exceedence and begins implementation 1.5 years from the date of the exceedence. The compliance determination will be conducted as described in this paragraph.

(iii) The State shall approve or disapprove a local MMM program plan

within 6 months from the date of receipt. If the State does not disapprove the local MMM program plan during such period, the CWS shall implement the plan submitted to the State for approval.

(iv) If the State determines the CWS is not adequately implementing the local MMM plan approved by the State, the system shall incur an MMM violation.

(v) During the MMM program 5-year review periods, the system shall incur an MMM violation if the State determines the CWS is not meeting MMM program plan objectives.

**§ 141.302 Multimedia mitigation (MMM) requirements (required elements of MMM program plans).**

The following are required for approval of State MMM program plans by EPA. Local MMM program plans developed by community water systems (CWS) are deemed to be approved by EPA if they meet these criteria (as appropriate for the local level) and are approved by the State. The term ''State'', as referenced next, means any entity submitting an MMM program plan for approval, including States, with and without primacy, Indian Tribes and community water systems.

(a) *Description of process for involving the public.* (1) States are required to involve community water system customers, and other sectors of the public with an interest in radon, both in drinking water and in indoor air, in developing their MMM program plan. The MMM program plan must include:

(i) A description of processes the State used to provide for public participation in the development of its MMM program plan, including the components identified in paragraphs (b), (c), and (d) of this section;

(ii) A description of the nature and extent of public participation that occurred, including a list of groups and organizations that participated;

(iii) A summary describing the recommendations, issues, and concerns arising from the public participation process and how these were considered in developing the State's MMM program plan; and

(iv) A description of how the State made information available to the public to support informed public participation, including information on the State's existing indoor radon program activities and radon risk reductions achieved, and on options considered for the MMM program plan along with any analyses supporting the development of such options.

(2) Once the draft program plan has been developed, the State must provide notice and opportunity for public comment on the draft plan prior to submitting it to EPA.

(b) *Quantitative goals.* (1) States are required to establish and include in their plans quantitative goals, to measure the effectiveness of their MMM program, for the following:

(i) Existing houses with elevated indoor radon levels that will be mitigated by the public; and

(ii) New houses that will be built radon-resistant by home builders.

(2) These goals must be defined quantitatively either as absolute numbers or as rates. If goals are defined as rates, a detailed explanation of the basis for determining the rates must be included.

(3) States are required to establish goals for promoting public awareness of radon health risks, for testing of existing homes by the public, for testing and mitigation of existing schools, and for construction of new public schools to be radon-resistant, or to include an explanation of why goals were not established in these program areas.

(c) *Implementation Plans.* (1) States are required to include in their MMM program plan implementation plans outlining the strategic approaches and specific activities the State will undertake to achieve the quantitative goals identified in paragraph (b) of this section. This must include implementation plans in the following two key areas:

(i) Promoting increased testing and mitigation of existing housing by the public through public outreach and education and during residential real estate transactions.

(ii) Promoting increased use of radon-resistant techniques in the construction of new homes.

(2) If a State has included goals for promoting public awareness of radon health risks; promoting testing of existing homes by the public; promoting testing and mitigation of existing schools; and promoting construction of new public schools to be radon resistant, then the State is required to submit a description of the strategic approach that will be used to achieve the goals.

(3) States are required to provide the overall rationale and support for why their proposed quantitative goals identified in paragraph (b) of this section, in conjunction with their program implementation plans, will satisfy the statutory requirement that an MMM program be expected to achieve equal or greater risk reduction benefits to what would have been expected if all community water systems in the State complied with the MCL.

(d) *Plans for measuring and reporting results.* (1) States are required to include in the MMM plan submitted to EPA a description of the approach that will be used to assess the results from implementation of the State MMM program, and to assess progress towards the quantitative goals in paragraph (b) of this section. This specifically includes a description of the methodologies the State will use to determine or track the number or rate of existing homes with elevated levels of radon in indoor air that are mitigated and the number or the rate of new homes built radon-resistant. This must also include a description of the approaches, methods, or processes the State will use to make the results of these assessments available to the public.

(2) If a State includes goals for promoting public awareness of radon health risks; testing of existing homes by the public; testing and mitigation of existing schools; and construction of new public schools to be radon-resistant; the State is required to submit a description of how the State will determine or track progress in achieving each of these goals. This must also include a description of the approaches, methods, or processes the State will use to make these results of these assessments available to the public.

**§ 141.303 Multimedia mitigation (MMM) reporting and compliance requirements.**

(a) In accordance with the Safe Drinking Water Act (SDWA), EPA is to review State MMM programs at least every five years. For the purposes of this review, the States with EPA-approved MMM program plans shall provide written reports to EPA in the second and fourth years between initial implementation of the MMM program and the first 5-year review period, and in the second and fourth years of every subsequent 5-year review period. States that submit a letter to the Administrator by [90 days after date of publication of the final rule in the **Federal Register**] committing to develop an MMM program plan, must submit their first 2-year report by 6.5 years from publication of the final rule. For States not submitting the 90-day letter, but choosing subsequently to submit an MMM program plan and adopt the AMCL, the first 2-year report must be submitted to EPA by 5 years from publication of the final rule. EPA will review these programs to determine whether they continue to be expected to achieve risk reduction of indoor radon using the information provided in the two biennial reports.

(b)(1) These reports are required to include the following information:

(i) A quantitative assessment of progress towards meeting the required goals described in § 141.302(b), including the number or rate of existing homes mitigated and the number or rate of new homes built radon-resistant since implementation of the States' MMM program, and,

(ii) A description of accomplishments and activities that implement the required program strategies, described in § 141.302(c), outlined in the implementation plans and in the two required areas of promoting increased testing and mitigation of existing homes and promoting increased use of radon-resistant techniques in construction of new homes.

(2) If goals were defined as rates, the State must also provide an estimate of the number of mitigations and radon-resistant new homes represented by the reported rate increase for the two-year period.

(3) If the MMM program plan includes goals for promoting public awareness of the health effects of indoor radon, testing of homes by the public; testing and mitigation of existing schools; and construction of new public schools to be radon-resistant, the report is also required to include information on results and accomplishments in these areas.

(c) If EPA determines that a MMM program is not achieving progress towards its goals, EPA and the State shall collaborate to develop modifications and adjustments to the program to be implemented over the five year period following the review. EPA will prepare a summary of the outcome of the program evaluation and the proposed modification and adjustments, if any, to be made by the State.

(d) If EPA determines that a State MMM program is not achieving progress towards its MMM goals, and the State repeatedly fails to correct, modify and adjust implementation of their MMM program after notice by EPA, EPA will withdraw approval of the State's MMM program plan. CWSs in the State would then be required to comply with the MCL, or develop a State-approved CWS MMM program plan. The State will be responsible for notifying CWSs of the Administrator's withdrawal of approval of the State-wide MMM program plan. EPA will work with the State to establish a State process for review and approval of CWS MMM program plans that meet the required criteria, including local public participation in development and review of the program plan, and a time frame for submission of program plans by CWSs that choose to continue complying with the AMCL.

(e) States shall make available to the public each of these two-year reports identified in paragraph (a) of this section, as well as the EPA summaries of the five-year reviews of a State's MMM program, within 90 days of completion of the reports and the review.

(f) In primacy States without a State-wide MMM program, the States shall provide a report to EPA every five-years on the status and progress of CWS MMM programs towards meeting their goals. The first of such reports would be due by [10.5 years after date of publication of the final rule in **Federal Register**].

**§ 141.304 Local multimedia mitigation program plan approval and program review.**

(a) In States without an EPA-approved MMM program plan, any community water system may elect to develop and implement a local MMM program plan that meets the criteria in § 141.302 and comply with the AMCL in lieu of the MCL. Local CWS MMM program plans must be approved by the State.

(b) CWSs with State-approved MMM program plans shall report to the State as required by the State. States shall review such local programs at least every five years to determine if CWSs are implementing their program plans and making progress towards their goals. If the CWS fails to meet those requirements, the State shall require the system to comply with the MCL.

**§ 141.305 States that do not have primacy.**

(a) If a State, as defined in section 1401 of the Act, that does not have primary enforcement responsibility for the Public Water System Program under section 1413 of the Act chooses to submit an MMM program plan to EPA, that program plan must meet the criteria in § 141.301. EPA will approve such program plans in accordance with the requirements of § 141.302.

(b) States with EPA-approved MMM program plans shall report to EPA in accordance with the requirements of § 141.303.

## PART 142—NATIONAL PRIMARY DRINKING WATER REGULATIONS IMPLEMENTATION

1. The authority citation for part 142 continues to read as follows:

**Authority:** 42 U.S.C. 300f, 300g–1, 300g–2, 300g–3, 300g–4, 300g–5, 300g–6, 300j–4, 300j–9, and 300j–11.

2. Section 142.12 is amended by adding new paragraph (b)(4) to read as follows:

**§ 142.12 Revision of State programs.**

* * * * *

(b) * * *

(4) To be granted an extension for radon regulatory requirements included under 40 CFR part 141, subpart R, the State must commit to adopt the AMCL and MMM program plan, or MCL.

* * * * *

3. Section 142.15 is amended by adding new paragraph (c)(6) to read as follows:

**§ 142.15 Reports by States.**

* * * * *

(c) * * *

(6) In accordance with the Safe Drinking Water Act (SDWA), EPA is to review State MMM programs at least every five years. EPA will review these programs to determine whether they continue to be expected to achieve risk reduction of indoor radon using the information provided in the two biennial reports. For the purposes of this review:

(i)(A) States with EPA-approved MMM program plans shall provide written reports to EPA in the second and fourth years between initial implementation of the MMM program and the first 5-year review period, and in the second and fourth years of every subsequent 5-year review period.

(B) States that submit a letter to the Administrator by [90 days after date of publication of the final rule in the **Federal Register**] committing to develop an MMM program plan, must submit their first 2-year report by [6.5 years after date of publication of the final rule in the **Federal Register**]. For States not submitting the 90-day letter, but choosing subsequently to submit an MMM program plan and adopt the AMCL, the first 2-year report must be submitted to EPA by [5 years after date of publication of the final rule in the **Federal Register**].

(ii) These reports are required to include the following information:

(A) A quantitative assessment of progress towards meeting the required goals described in § 141.302(b), including the number or rate of existing homes mitigated and the number or rate of new homes built radon-resistant since implementation of the States' MMM program, and

(B) A description of accomplishments and activities that implement the required program strategies, described in § 141.302(c), outlined in the implementation plans and in the two required areas of promoting increased testing and mitigation of existing homes and promoting increased use of radon-resistant techniques in construction of new homes.

(C) If goals were defined as rates, the State must also provide an estimate of

the number of mitigations and radon-resistant new homes represented by the reported rate increase for the two-year period.

(D) If the MMM program plan includes goals for promoting public awareness of the health effects of indoor radon, testing of homes by the public; testing and mitigation of existing schools; and construction of new public schools to be radon-resistant, the report is also required to include information on results and accomplishments in these areas.

(iii) States shall make available to the public each of these two-year reports, as well as the EPA summaries of the five-year reviews of a State's MMM program, within 90 days of completion of the reports and the review.

(iv) In primacy States without a State-wide MMM program, the States shall provide a report to EPA every five-years on the status and progress of CWS MMM programs towards meeting their goals. The first of such reports would be due by [10.5 years after date of publication of the final rule in the **Federal Register**].

* * * * *

4. Section 142.16 is amended by adding new paragraph (i) to read as follows:

**§ 142.16 Special primacy requirements.**

* * * * *

*(i) Requirements for States to adopt 40 CFR part 141, subpart R.* In addition to the general primacy requirements elsewhere in this part, including the requirement that State regulations be at least as stringent as federal requirements, an application for approval of a State program revision that adopts 40 CFR part 141, subpart R, must contain a description of how the State will accomplish the program requirements for implementation of the AMCL and MMM program plan or the MCL as follows:

(1) If a State chooses to develop and implement a State-wide MMM program plan and adopt the AMCL, the primacy application must include the following elements:

(i) A copy of the State-wide MMM program plan prepared to meet the criteria outlined in § 141.302 of this chapter.

(ii) A description of how the State will make resources available for implementation of the State-wide MMM program plan.

(iii) A description of the extent and nature of coordination between interagency programs (*i.e.*, indoor radon and drinking water programs) on development and implementation of the MMM program plan, including the level of resources that will be made available for implementation and coordination between interagency programs (*i.e.*, indoor air and drinking water programs).

(2) If a State chooses to adopt the MCL the primacy application must contain the following:

(i) A description of how the State will implement a program to approve local CWS MMM program plans prepared to meet the criteria outlined in § 141.302 of this chapter and a description of the State's authority to implement this program.

(ii) A description of how the State will ensure local CWS MMM program plans are implemented.

(iii) A description of reporting and record keeping requirements for local CWS MMM programs.

(iv) A description of how the State will review local CWS program plans at least every five years to determine if they are implementing the MMM program and making progress towards their goals.

(v) A description of the procedures and schedule the State will use in withdrawing State approval of a CWS MMM program plan and notifying the CWS that they are required to comply with the MCL.

(vi) A description of the extent and nature of coordination between interagency programs (*i.e.*, indoor radon and drinking water programs) on development and implementation of the State process for review and approval of CWS MMM program plans. This description includes the level of resources that will be made available for implementation and coordination between interagency programs (*i.e.*, indoor air and drinking water programs).

(vii) A description of how the State will make required CWS reports available to the public.

5. A new § 142.65 is added to subpart G, to read as follows:

**§ 142.65. Variances and exemptions from the maximum contaminant level for radon.**

(a) The Administrator, pursuant to section 1415(a)(1)(A) of the Act, hereby identifies in the following table as the best technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant level for radon:

BAT for Radon–222

1. For all systems: High-Performance Aeration [1]

2. For systems serving 10,000 persons or fewer: High-Performance Aeration [1] or [2], Granular Activated Carbon [2] (GAC), and Point-of-Entry GAC [2].

(b) A State shall require a community water system to install and/or use any treatment method identified in paragraph (a) of this section as a condition for granting a variance, based upon an evaluation satisfactory to the State that indicates that alternative sources of water are not reasonably available to the system.

(c) Bottled water and/or granular activated carbon point-of-use devices cannot be used as means of being granted a variance or an exemption for radon.

(d) Community water systems that use point-of-entry devices as a condition for obtaining a variance or an exemption from NPDWRs must meet the following requirements:

(1) All point-of-entry units shall be owned, controlled, and maintained by the community water system or by a person or persons under contract with the public water system to ensure proper operation and maintenance of the unit under the terms of the variance or exemption.

(2) All point-of-entry units shall be equipped with mechanical warning devices to ensure that customers are notified of operational problems.

(3) If the American National Standards Institute has issued product standards applicable to a specific type of point-of-entry device for radon,

[1] High Performance Aeration is defined as the group of aeration technologies that are capable of being designed for high radon removal efficiencies, *i.e.*, Packed Tower Aeration, Multi-Stage Bubble Aeration and other suitable diffused bubble aeration technologies, Shallow Tray and other suitable Tray Aeration technologies, and any other aeration technologies that are capable of similar high performance.

[2] As defined and described in 40 CFR 141.66 (e).

individual units of that type shall not be accepted under the terms of the variance or exemption unless they are independently certified in accordance with such standards.

(4) Before point-of-entry devices are installed, the community water system must obtain the approval of a monitoring plan which ensures that the devices provide health protection equivalent to analogous centralized water treatment.

(5) The community water system must apply effective technology under a State-approved plan. The microbiological safety of the water must be maintained at all times.

(6) The State must require adequate certification of performance, field testing, and, if not included in the certification process, a rigorous engineering review of the point-of-entry devices.

(7) The design and application of point-of-entry devices must consider the potential for increasing concentrations of heterotrophic bacteria in water treated with activated carbon. It may be necessary to use frequent backwashing, post-GAC contactor disinfection, and Heterotrophic Plate Count monitoring to ensure that the microbiological safety of the water is not compromised.

6. Section 142.72 is amended by removing the introductory text, by redesignating paragraphs (a) through (d) as (b)(1) through (b)(4), and by adding a new paragraph (a) to read as follows:

**§ 142.72. Requirements for Tribal eligibility.**

(a) If a Tribe meets the criteria in paragraph (b) of this section, the Administrator is authorized to treat an Indian Tribe as eligible to apply for:

(1) Primary enforcement responsibility for the Public Water System Program:

(2) Authority to waive the mailing requirements of 40 CFR 141.155(a); and

(3) Authority to develop and implement a radon multimedia mitigation program in accordance with 40 CFR part 141, subpart R.

* * * * *

7. Section 142.78 is amended by revising paragraph (b) to read as follows:

**§ 142.78. Procedure for processing an Indian Tribe's application.**

* * * * *

(b) A Tribe that meets the requirements of § 142.72 is eligible to apply for development grants and primary enforcement responsibility for a Public Water System and associated funding under section 1443(a) of the Act, for primary enforcement responsibility for public water systems under section 1413 of the Act, for the authority to waive the mailing requirements of 40 CFR 141.155(a), and for the authority to develop and implement a radon multimedia mitigation program in accordance with 40 CFR part 141, subpart R.

8. Part 142 is amended by adding a new Subpart L to read as follows:

## Subpart L—Review of State MMM Programs

**§ 142.400 Review of State MMM programs and procedures for withdrawing approval of State MMM programs.**

(a)(1)At least every five years, the Administrator shall review State MMM programs. For the purposes of this review, States with EPA-approved MMM programs shall provide written reports to the Administrator in the second and fourth years between initial implementation of the MMM program and the first 5-year review period, and in the second and fourth years of every subsequent 5-year review period. The written reports will discuss the status and progress of their program towards meeting their MMM goals. The Administrator will use the information provided in the two biennial reports in discussions and consultations with the State to review the programs to determine whether they continue to be expected to achieve risk reduction of indoor radon.

(2) If the Administrator determines that a State MMM program is not achieving progress towards its MMM goals, the Administrator and the State shall collaborate to develop modifications and adjustments to the program to be implemented over the five year period following the review. EPA will prepare a summary of the outcome of the program evaluation and the proposed modification and adjustments, if any, to be made by the State.

(3) If the State repeatedly fails to correct, modify or adjust implementation of its MMM program after notice by the Administrator, the Administrator shall initiate proceedings to withdraw approval of the State's MMM program plan. The Administrator shall notify the State in writing that EPA is initiating withdrawing a State-wide MMM program plan and shall summarize in the notice the information available that indicates that the State is no longer achieving progress towards its MMM goals.

(4) The State notified pursuant to paragraph (a)(3) of this section may, within 30 days of receiving the Administrator's notice, submit to the Administrator evidence that the State plans to implement modifications to the State MMM program.

(5) After reviewing the submission of the State, if any, made pursuant to paragraph (a)(4) of this section, the Administrator shall make a final determination either that the State no longer continues to achieve progress towards its MMM goals, or that the State continues to implement modifications to the State MMM program, and shall notify the State of his or her determination. Before a final determination that the State no longer continues to achieve progress towards its MMM goals, the Administrator shall offer a public hearing and will publish a notice in the **Federal Register**.

(b) If approval of a State's MMM program is withdrawn, the State will be responsible for notifying CWSs of the Administrator's withdrawal of approval of the State-wide MMM program plan. The CWSs in the State would then be required to comply with the MCL. EPA will work with the State to establish a State process for review and approval of CWS MMM program plans that meet the required criteria and a time frame for submittal of program plans by CWSs that choose to continue complying with the AMCL. The review process will allow for local public participation in development and review of the program plan.

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